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The Role of First Language Literacy and Second Language Proficiency in Second Language Reading Comprehension

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ABSTRACT

This study examined the interrelationships of first language (L1) literacy, second language (L2) proficiency, and L2 reading comprehension with 246 Chinese college students learning English. L1 literacy and L2 proficiency were measured with college admission exams in Chinese and English. L2 reading comprehension was measured with the reading comprehension section of a TOEFL and a researcher-developed passage comprehension test. L1 literacy was found to be moderately correlated with L2 language proficiency, as was L2 language proficiency with L2 reading comprehension. Regression analyses demonstrated that L2 language proficiency accounted for 27%-39% of variance in L2 reading comprehension, while L1 literacy accounted for less than 6% of the variance. These findings confirmed the assumption that L2 language proficiency contributes up to 30% of the variance in L2 reading performance, but failed to provide evidence that L1 literacy contributes up to about 20% of the variance in L2 reading.

INTRODUCTION

The second language (L2) reading process involves the interplay of two language systems. When reading in a second language, readers have access to their first language (L1) and often use their L1 as a reading strategy (Carson, Carrell, Silberstein, Kroll, & Kuehn, 1990; Upton & Lee-Thompson, 2001). However, L1 and L2 reading differ in many ways. Grabe (2009) indicates three major sets of differences: linguistic and processing differences, cognitive and educational differences, and sociocultural and institutional differences. Although L1 and L2 reading differ in a number of important ways, to better understand L2 reading, it is important to understand what role L1 literacy plays in the development of L2 reading (Hudson, 2007). The role of L1 literacy in L2 reading development had largely been a "missing" variable in empirical research until the 1990s, and only recently have researchers emphasized the importance of the impact of L1 literacy knowledge on L2 reading development (Bernhardt, 2005; Koda, 2005, 2007).

LITERATURE REVIEW

There are two main positions regarding the relationship between L1 literacy and L2 reading development: the *Linguistic Interdependence Hypothesis* and the *Linguistic Threshold Hypothesis*. According to the Linguistic Interdependence Hypothesis, L1 literacy provides a good foundation for second language reading development. The hypothesis posits that fundamental similarities exist between first and second language skills, and that they are interdependent. Specifically, reading performance in a second language is largely shared with reading ability in a first language (Bernhardt & Kamil, 1995). When students are literate in their primary language, they possess funds of knowledge about various aspects of reading, and this knowledge provides an experiential base for literacy development in the second language (Moll, 1994; Peregoy & Boyle, 2000). In other words, language operations such as reading and writing should be transferable across languages. Once a set of language operations has been acquired, they will also be available within second language contexts.

The role of L2 language proficiency in L2 reading development has been emphasized through the alternative hypothesis regarding the relationship between L1 reading and L2 reading, which is the Linguistic Threshold Hypothesis. The main assumption of the Linguistic Threshold Hypothesis (Cummins, 1979) or Linguistic Ceiling (Clarke, 1979, 1980) is that readers will need to develop a certain level of language proficiency in the target language before they can transfer L1 reading skills or strategies to improve L2 reading comprehension. Before this threshold level of language proficiency or linguistic ceiling is reached, whether or not they read well in their L1 does not make much difference in their L2 reading performance (Lee & Schallert, 1997).

The argument between the two hypotheses has not been whether there is transfer or not, but rather *when* transfer occurs (Bernhardt, 2005; Grabe, 2009). The following literature review examines research-based evidence for both hypotheses in order to demonstrate our current understanding of the relationship between L1 literacy, L2 proficiency, and L2 reading comprehension.

Empirical Evidence for the Linguistic Interdependence Hypothesis

Empirical research has provided some support to the Linguistic Interdependence Hypothesis. Research on the reading abilities of bilingual children has demonstrated moderate but significant relationships between their L1 and L2 reading abilities (Bernhardt & Kamil, 1995; Cummins, 1991; Van Gelderen, et al., 2004; Van Gelderen, Schoonen, Stoel, de Glopper & Hulstijn, 2007; Verhoeven, 1991, 1994, 2000; Droop & Verhoeven, 2003). For example, as stated by Verhoeven (1991), "literacy skills being developed in one language strongly predict corresponding skills in another language acquired later in time" (p. 72).

Verhoeven (1991) examined the processes of biliteracy development of 138 First-Grade Turkish children in the Netherlands. One group of children was involved in an L2 submersion curriculum, which provided L2 literacy instruction before L1 literacy instruction. The other group of children followed the L1/L2 transitional curriculum, where literacy skills were first taught in L1. The submersion group exhibited a strong transfer from earlier acquired decoding and reading comprehension skills in L2 to later-acquired similar skills in L1, and the L1/L2 transition group also demonstrated a positive transfer of L1 literacy skills to similar skills in L2.

Van Gelderen et al. (2004, 2007) represent another example that supports the Linguistic Interdependence Hypothesis. These authors investigated Dutch-as-L1 and English-as-L2 reading

comprehension development of 389 adolescent students during a three-year span from Grades 8 through 10. Analyses of students' performances on reading comprehension, linguistic knowledge, processing efficiency in both languages, and their metacognitive knowledge about reading indicated that the component skills of L1 and L2 reading held different weights in L1 and L2 reading models. In addition, L1 reading comprehension was found to correlate strongly with L2 reading comprehension and contribute more to L2 reading comprehension than other L2 component skills. These results support the Linguistic Interdependence Hypothesis and L1-L2 transfer of reading skills.

However, transfer between languages does not seem to occur for all literacy skills. For example, Verhoeven (1994) indicated transfer of pragmatic, phonological, and literacy skills from Turkish to Dutch, but not lexical and syntactic skills. In that study, Verhoeven investigated the development of lexical, morphosyntactic, pragmatic, phonological, and reading abilities in the first and second languages of 98 Turkish children in the Netherlands. Reading skills were found to be highly interdependent between L1 and L2, which also supports the argument that reading skills in a general sense are interdependent and transferable between L1 and L2. However, little evidence of interdependence was found for lexical and morphosyntactic skills.

In fact, later studies by Verhoeven and colleagues (Verhoeven, 2000; Droop & Verhoeven, 2003) have demonstrated the importance of L2 language knowledge in L2 reading. Verhoeven (2000) investigated the early reading and spelling processes of children learning to read in an L1 and L2 during the first two grades at primary school. Vocabulary knowledge was found to have a greater impact on reading comprehension of the L2 learners than on the L1 learners. Similarly, Droop and Verhoeven (2003) showed that for L2 learners, L2 language skills were highly related to L2 reading ability.

The findings indicate that, lexical and syntactic skills are not likely to be readily transferred between L1 and L2, and these skills are strong predictors of L2 reading abilities (Verhoeven, 1994, 2000; Droop & Verhoeven, 2003). In other words, in addition to the transferred L1 reading skills, L2 language skills are also important to L2 reading. For L2 learners, vocabulary and syntactic knowledge are typical aspects of their L2 language proficiency. In order to improve their L2 reading ability, L2 learners need to develop their L2 language proficiency.

One of the weaknesses of the Linguistic Interdependence Hypothesis lies in its negligence of the importance of L2 language proficiency. According to the hypothesis, "L2 language proficiency, as opposed to L1 reading abilities, is not critical to the development of L2 reading," and L2 students "can have weak L2 language proficiency, but use all of their L1 academic reading skills to carry out L2 academic reading tasks successfully" (Grabe, 2009, p. 141).

Empirical Evidence for the Linguistic Threshold Hypothesis

A number of studies have provided evidence for the Linguistic Threshold Hypothesis. Bernhardt and Kamil (1995) examined the relationship between L1 literacy and L2 reading among 186 adult, native English speakers learning Spanish at beginning, intermediate, and advanced proficiency levels. Their results indicated that L2 language proficiency accounted for 32-38% of the variance in L2 reading, while L1 reading accounted for 10-16%. L2 language proficiency is a more powerful predictor of L2 reading ability than L1 reading ability, although L1 is also a very important variable.

Bossers (1991) examined the relationship among L1 reading ability, L2 language ability, and L2 reading ability with 50 native Turkish speakers who are learning Dutch with high L1 proficiency and intermediate to advanced L2 language proficiency. The study found that both L2 ability and L1 reading played a substantial role in L2 reading, accounting together for approximately 72% of the variability in L2 reading scores in which L2 language ability accounted for nearly four times more than L1 reading ability. Bossers then further examined the performances of the top 30% and the lowest 70% of the participants. He found that only L2 language ability was a significant predictor of L2 reading ability for the lowest 70%, while only L1 reading ability was a significant predictor of L2 reading ability for the top 30%.

Brisbois (1995) also examined the relationship between L1 reading, L2 knowledge, and L2 reading with 131 beginning and upper level English native speakers learning French as L2. L1 reading comprehension was assessed through two tasks: the Nelson-Denny Reading Test and written recall protocols. When the Nelson-Denny score was used for L1 reading, all three variables (i.e., L1 reading, L2 vocabulary, and L2 grammar) contributed significantly to L2 reading for beginning learners, with L2 vocabulary being the primary contributor. However, none of these independent variables were significant for the upper level students. When free recall scores were used to represent L1 reading, the independent variables were significant predictors of L2 reading for both beginning and upper level students.

Carrell (1991) investigated the relationship between L1 and L2 reading comprehension of 45 native Spanish speakers learning English (as L2), and 75 native English speakers studying Spanish (as L2). The L2 proficiency of Spanish L1 students ranged from intermediate to advanced, while that of English L1 students ranged from beginning to intermediate. The results showed significant effects for both L1 reading ability and L2 proficiency on L2 reading performance, without a clear relationship regarding which is most important. For the Spanish L1 speakers, their L1 reading ability had greater predictive power, while for the English L1 speakers, their L2 proficiency was the greater predictor.

Lee and Schallert (1997), in their study with 809 ninth- and tenth-grade Korean EFL students, found that L1 reading ability and L2 proficiency accounted for 62% of the variability in L2 reading, with L2 proficiency contributing more than L1 reading ability. For the top 60% of the groups, the authors observed a strong relationship between increases in L1 reading score and L2 reading score.

In their study with 158 Japanese ESL students at low-intermediate to intermediate proficiency levels, Perkins, Brutten, and Pohlmann (1989) found that the higher the learner's L2 ability, the stronger the relationship is between L1 and L2 reading, which provides support for the argument that there is some general threshold at which L2 readers begin to transfer L1 reading skills and strategies.

Similarly, in a one-year longitudinal study with 52 Bosnians learning French as an L2, Pichette, Segalowitz, and Connors (2003) found that only L2 knowledge was a significant predicting factor of L2 reading ability at the beginning of the study but both L2 knowledge and L1 reading ability emerged as significant factors by the end of the study with much improvement of L2 knowledge after one year. The result suggested that L1 reading skills began to transfer to L2 reading as learners' L2 knowledge improved.

As part of their study, Schoonen, Hulstijn, and Bossers (1998) also examined the predicting variables of L2 reading ability with 274 eighth- and tenth-grade Dutch EFL students. The study indicated that initially, L1 and L2 reading showed a strong relationship with a shared variance of 40%, but when L2 vocabulary and metacognitive knowledge were accounted for, the

shared variance between L1 and L2 reading diminished to about 1% for the 8th graders and less than 1% for the 10th graders. In other words, L2 vocabulary knowledge and metacognitive knowledge were stronger predictors of L2 reading ability than L1 reading ability.

Taillefer (1996) was interested in how different reading tasks might influence the interaction of L1 reading ability and L2 proficiency in L2 reading comprehension with 53 French second-year university EFL students. L1 reading and L2 reading were assessed with two tasks differing in cognitive demands: a scanning activity and a reading-for-meaning activity. The researcher found that both L1 reading ability and L2 proficiency were significant predictors of L2 reading, but to differing degrees depending upon the particular task. For the scanning task, L1 reading ability was the only significant predictor of performance only for the more proficient students; for the reading-for-meaning activity, L2 proficiency was the only significant predictor of L2 reading performance for all the students. This result indicates that more demanding reading tasks may call on a greater need for L2 proficiency.

In addition to investigating the relative contribution of L1 reading ability and L2 proficiency to L2 reading comprehension, Yamashita (2002) was interested in how L1 reading ability and L2 proficiency compensated for each other. With a sample of 241 Japanese university EFL students, the study found that both L1 reading ability and L2 proficiency were important predictors of L2 reading comprehension but L2 proficiency had a stronger effect on L2 reading ability. There was mutual compensation between L1 reading ability and L2 proficiency, but a small increase in L2 proficiency was found to compensate for a large decline in L1 reading ability in order to reach the same level of L2 reading ability.

Overall, the studies above support the existence of a language threshold. They have generated fairly consistent results: both L1 reading ability and L2 language proficiency contribute significantly to L2 reading ability, but L2 proficiency tends to be a stronger predictor of L2 reading than L1 reading ability, especially for learners who are not yet advanced (Bernhardt & Kamil, 1995; Bossers, 1991; Brisbois, 1995; Carrell, 1991; Lee & Schallert, 1997; Taillefer, 1996). Specifically, when learners are at a lower level of proficiency, they often rely more on their L2 language knowledge to facilitate their L2 reading comprehension, and L2 proficiency tends to play a greater role than does L1 reading ability. Once the readers become more advanced in their L2 proficiency, L1 reading ability becomes increasingly more important, thus leading to successful transfer of L1 reading skills to L2 reading, and to a stronger relationship between L1 and L2 reading.

However, the threshold of L2 language proficiency does not seem to be a single specific constant. Due to the continually changing relationship among L1 reading, L2 reading and L2 proficiency, determining where the threshold is in absolute terms is unlikely. The dynamic, interactive interrelationships among the three variables are affected by different factors such as the developmental stages of learners' reading abilities, the particular type of reading tasks, and the context of L2 learning. These interrelationships are likely to differ when children develop L1 and L2 reading abilities before Grade 4 (Verhoeven, 1991, 1994, 2000; Droop & Verhoeven, 2003), when adolescents develop L2 reading abilities from Grades 8 through 10 (Lee & Schallert, 1997; Van Gelderen et al., 2004, 2007), and when college-level adults develop L2 reading abilities (Carrell, 1991; Perkins et al., 1989; Taillefer, 1996). They may also depend upon what type of reading tasks are involved (Taillefer, 1996). The context of L2 learning can also make a difference. Whether learners are learning their L2 in a second- or foreign-language environment might also alter the balance of the formula (Carrell, 1991). According to Grabe (2009), "All of these issues suggest the need for further research that describes and explains continually

changing relationships among various facets of L2 proficiency and reading sub-skills development" (p. 148).

L1-L2 Orthographic Distance

Overall, previous research findings present a wide range of variability in terms of the importance of L1 reading ability and L2 proficiency in L2 reading comprehension. Based on her review of previous studies, Bernhardt (2005) concludes that the contribution of L1 reading to L2 reading is between 14% and 21%, and the contribution of L2 language knowledge to L2 reading performance is around 30%. However, she acknowledges the lack of data from non-syllabic languages and calls on future research to examine the generalizability of the findings.

It is logical to assume that normal adult L2 readers with good educational background in L1 have developed sufficient L1 reading skills and strategies, and that they actually apply these skills and strategies when reading in L2. However, it is not yet clear whether or not this transfer is successful to learners of all L1 backgrounds. While L1 skills may facilitate in situations where the orthographies are similar, the L1 skills used to read a logographic language such as Chinese may be too specific to transfer to the reading of an alphabetic language. The availability of L1 reading skills and strategies for L2 reading was found to differ when the orthographic features of the two languages are different. Akamatsu (1999) found support for the differential availability of first language reading strategies between languages that are alphabetic (Farsi) and those that are not (Chinese and Japanese). Learners from non-alphabetic languages had more difficulty processing upper and lower orthographic case alternations.

In the context of cross-linguistic reading research, together with L1 and L2 processing experiences, the L1-L2 orthographic distance has been identified as one of the three factors which are crucial in accounting for performance differences in L2 decoding across L1 groups (Koda, 1996, 1999, 2007). In terms of developing L2 reading skills in English, which employs an orthographic system based on the Roman alphabet, learners coming from alphabetic L1 orthographic backgrounds (e.g., Spanish, Indonesian, and Korean) should have an advantage in L2 reading over those coming from non-alphabetic L1 backgrounds (e.g., Chinese and Japanese) due to their intra-word analysis experience in processing alphabets in L1s (Muljani, Koda, & Moates, 1998; Wang & Koda, 2005; Koda, 2007). Therefore, the role of L1 reading ability in L2 reading can be different between learners of alphabetic or non-alphabetic L1 backgrounds. Previous research has mainly focused on learners of alphabetic L1 backgrounds. Therefore, data from learners of non-alphabetic L1 backgrounds will add valuable insights regarding the interrelationships among L1 reading, L2 proficiency, and L2 reading (Bernhardt, 2005).

The present study examines the interrelationships of L1 literacy, L2 proficiency, and L2 reading with learners of English whose first language is Chinese. The study aims to answer the following research questions:

1. Are there significant positive relationships between L1 literacy, L2 proficiency, and L2 reading ability?

2. What are the contributions of L1 literacy and L2 proficiency to L2 reading comprehension?

METHOD

Participants

The participants of the study were 246 first-semester, non-English-major undergraduate students at a large comprehensive university in Shanghai, China. They studied English for at least six years in Chinese junior- and senior-high schools before coming to college. The average age was 18.81 years (SD = 0.85), and there was almost an equal proportion of male and females (male = 52%, female = 48%). Their average reported length of learning English was 8.83 years (SD = 1.87), and they were from 14 different departments. All were enrolled in a course titled College English, which was a required core course for all non-English majors, and were from 6 of these classes.

Instruments and Procedures

The measures of L1 literacy and L2 proficiency were the Chinese and English tests used in Shanghai in 2005 for college admission. The Chinese-college entrance exam had a total of 150 points and consisted of two parts, reading and writing. The reading section was 80 points and the writing section was 70 points. In the reading section, half of the points (40 points) were based on the reading of two passages in modern Chinese. Students were asked to read the passages and answer multiple-choice and short-answer questions. The other half of the reading section (40 points) was based on the reading of classical literary prose by ancient writers. Students were asked to read some poems and short essays, answer multiple-choice, short-answer questions, and translate words and sentences into modern Chinese. In the writing section of the text, students were prompted with three scenarios stating the popularity of *wuxia* fiction (a broad genre of Chinese fiction which concerns itself with martial arts adventures set primarily in ancient China), pop music, and commercials which form a large part of the popular culture. Students were asked to write an essay of 800 words or longer discussing how the popular culture has been influencing the younger generation.

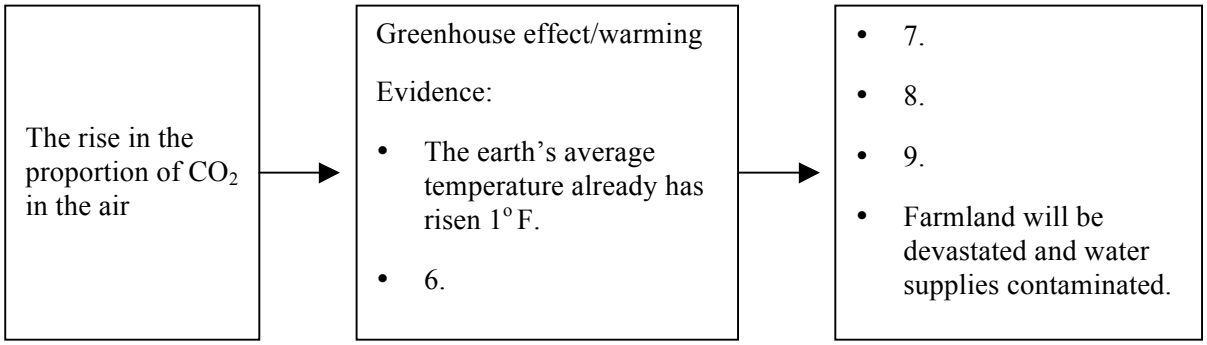
The English-college entrance exam consisted of four parts (listening comprehension, grammar and vocabulary, cloze, and reading comprehension), with a total of 150 points. The first three parts were 40 points each, and there were 30 points for the reading-comprehension section. In the section of listening comprehension, students listened to ten short conversations, two short passages, and two longer conversations. Multiple-choice items followed the short conversation and short passage tasks, whereas the longer conversations were followed by short-answer/fill-the-blank items. In the section of grammar and vocabulary, students were given 20 multiple-choice items and they were asked to choose the best answer to complete each sentence. In the cloze section, there were two passages with ten blanks each. Students were asked to fill in each blank by choosing one of the four alternatives that best fit the context. Finally, in the reading comprehension section, students read 4 passages followed by a total of 15 multiple-choice items. Due to the lack of access to the item-level test data and the variations in item types and weightings, the internal consistency reliability coefficients were not calculated for these measures.

Two measures were used for L2 reading ability: the reading comprehension section of the Test of English as a Foreign Language (TOEFL) and a passage-comprehension test developed by the researcher. This version of the TOEFL was used by the Educational Testing Service (ETS) in

1997. It was unpublished but available for research purposes by request. The TOEFL is an internationally accepted measure of English learners' language proficiency, and provided a valid baseline to situate the target learners in this study in the more general population of English-language learners. The test had a total of 50 multiple-choice items based on 5 reading passages. The answers were scored as either correct or incorrect, and the total score was 49. (The last item was not scored, following the ETS answer-key suggestion.) The internal consistency reliability coefficient (Cronbach's alpha) was 0.80 for this sample.

The researcher-developed passage-comprehension test included one reading passage of approximately 750 words. The organizational patterns of the text were mainly cause-effect and problem-solution. The Flesch-Kincaid Grade Level of the passage was 10.2. Students read the passage and answered 15 multiple-choice comprehension questions with four alternatives. Then they filled in 20 blanks contextualized in partially completed graphic organizers created for the passage. The following example in Figure 1 shows items 6-9 in a cause-effect graphic organizer.

Figure 1. Example of Graphic Organizer Items



The multiple-choice items were scored as correct or incorrect, with one point assigned to each correct answer and zero points for each incorrect answer. For the graphic organizer items, each item was assigned one point when the answer was acceptable. A score of zero was given for each unacceptable answer. No partial credit was given. Therefore, the total score for the passage comprehension measure was 35.

The graphic organizer completion task is a production task which involves subjective scoring. In order to score student performance reliably, a detailed scoring rubric was developed to illustrate what to look for in an acceptable answer. Thirty-five percent of the test samples (93 copies) of the graphic organizer task were scored by two raters. The inter-rater reliability coefficient (Cronbach's alpha) was .99. One rater scored the rest of the tests and her grading was used in the analyses. The internal consistency reliability (Cronbach's alpha) of the multiple-choice task was .70, and that of the graphic-organizer task was .87.

Both the Chinese L1 literacy and English L2 proficiency tests lasted for 150 minutes. (The scores were made available for this study through the Provost Office at the University.) The L2 reading-comprehension test was completed in a block of 100 minutes during students' normal class time. The participants first had 50 minutes to finish the TOEFL reading test. After the test paper was collected, they were given the passage-reading comprehension test, in which they had about 45 minutes to complete, not including the time of collecting and distributing test papers. It is worth noting here that the tests were not given within the same time-frame: The college entrance exams (i.e., the Chinese L1 literacy and the English L2 proficiency tests) were given in early July of 2005, and they were high-stakes tests for which every student had studied hard.

Conversely, the L2 reading comprehension test was given in early September of that year after the students were admitted. Although second language reading ability has been considered a relatively stable construct (Grabe, 2009), the difference in the time frame of testing might have affected the results of the study.

RESULTS

Table 1 indicates the means and standard deviations of the measures. The average score on L1 literacy was 101.05 (SD = 9.22), the mean of L2 proficiency was 107.83 (SD = 17.22), the mean of the TOEFL reading was 17.63 (SD = 6.40), and the mean of the researcher-developed passage comprehension measure was 21.25 (SD = 7.52).

Table 1. Means and Standard Deviations of the Measures

	N	Mean	SD	Min.	Max.
L1 literacy	246	101.05	9.22	77.00	127.00
L2 proficiency	246	107.83	17.22	44.00	138.00
TOEFL reading	246	17.63	6.40	5.00	35.00
Passage comprehension	246	21.25	7.52	2	35.00

The correlation matrix of the variables is displayed in Table 2. All the correlation coefficients are statistically significant at the .01 level. They are all relatively low to moderate, from .24 between L1 literacy and both L2 reading measures to .63 between L2 proficiency and the L2 passage-comprehension measure.

Table 2. Correlation Matrix for All the Variables

	L1 Literacy	L2 Proficiency	TOEFL Reading	Passage Comprehension
L1 literacy	1.00			
L2 proficiency	.55**	1.00		
TOEFL reading	.24**	.52**	1.00	
Passage comprehension	.24**	.63**	.47**	1.00

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

Interestingly, the correlation between L2 proficiency and L1 literacy (r = .55) is approximately the same as the correlation between L2 proficiency and L2 reading comprehension (r = .52 for the TOEFL reading and r = .63 for passage comprehension). L2 proficiency seems to be related to L1 literacy and L2 reading comprehension to a very similar degree. In other words, the relationship between L1 literacy and L2 reading comprehension (with a correlation of .24) seems to be moderated by L2 proficiency. Students who do well in L1 literacy also tend to do well in L2 proficiency. Similarly, those who do well in L2 proficiency also tend to do well in L2 reading comprehension. Another interesting point to note is that the TOEFL reading and passage comprehension are only moderately correlated (r = .47). The TOEFL reading-comprehension test is clearly too difficult for the sample of participants in this

study (they scored only 36% in average). Moreover, the two measures of reading comprehension seem to tap into different aspects of the reading construct with the use of the new item type of graphic-organizer completion.

To answer the second research question (how students' performances on L1 literacy and L2 proficiency can predict their performance on L2 reading), the L1 literacy and L2 proficiency scores were first regressed against the TOEFL reading score and then the passage-comprehension score, following the procedures of hierarchical multiple regression. The results are shown in Tables 3 and 4.

Table 3. Summary of Hierarchical Multiple Regression on TOEFL Reading Comprehension

Model	β	SE	β (std)	T	Sig.	Df	R^2	Adj. R^2	ΔR^2	ΔF	Sig. F change
1. L1 literacy	.17	.04	.24	3.92	.000	1, 244	.06	.06	.06	15.32	.000
2. L1 literacy	-.04	.05	-.06	-.86	.39	2, 243	.27	.27	.21	70.82	.000
L2 proficiency	.20	.02	.55	8.42	.000						

Model 1 (i.e., the first model presented in the above table showing two models as labeled in the first column), in which L1 literacy was the sole predictor, accounted for 6% of the TOEFL Reading score variance (adjusted $R^2 = .06$). However, as soon as L2 proficiency was introduced to the regression equation in Model 2, the regression weight for L1 literacy turned out to be non-significant ($t = -.86$, $p > .05$). L2 proficiency added significantly to the prediction of the TOEFL Reading section score with the R^2 change of .21 and the F change of 70.82 ($p < .001$). L2 language proficiency accounted for approximately 27% of variance in TOEFL reading comprehension.

Table 4. Summary of Hierarchical Multiple Regression on Passage Comprehension

Model	β	SE	β (std)	T	Sig.	Df	R^2	Adj. R^2	ΔR^2	ΔF	Sig. F change
1. L1 literacy	.19	.05	.24	3.79	.000	1, 244	.06	.05	.06	14.38	.000
2. L1 literacy	-.12	.05	-.15	-2.54	.012	2, 243	.41	.40	.35	144.49	.000
L2 proficiency	.31	.03	.71	12.02	.000						

In Model 1, when L1 literacy was the only predictor, it accounted for 6% of the passage comprehension score variance (adjusted $R^2 = .05$). When L2 proficiency was added to the regression equation in Model 2 (i.e., the second model in the above table), it added significantly to the prediction of the passage comprehension score with the R^2 change of .35 and the F change of 144.49 ($p < .001$). Meanwhile, the contribution of L1 literacy remained significant ($t = -2.54$, $p < .05$). Unlike the previous analysis with the TOEFL reading score as the criterion variable, both L1 literacy and L2 proficiency emerged as significant factors. Together, the two variables accounted for 41% of shared variance in passage comprehension.

In summary, L2 proficiency was a significant predictor of L2 reading (either when L2 reading was measured with TOEFL reading comprehension or passage comprehension), while L1 literacy was a significant predictor of L2 reading only when it was measured with passage comprehension. In both cases, L2 proficiency was a major contributor to L2 reading comprehension.

DISCUSSION

The above analyses demonstrates that L1 literacy is moderately correlated with L2 language proficiency, and L2 language proficiency is moderately correlated with L2 reading comprehension, while the correlation between L1 literacy and L2 reading comprehension is quite low. L2 language proficiency accounts for about 27%-35% of variance independently in L2 reading comprehension, while L1 literacy does not seem to have an important role in L2 reading comprehension based on the measures in this study, accounting for only 6% of variance even when it is the only predictor. When L2 reading was measured with the TOEFL reading comprehension, L1 literacy did not contribute independently to L2 reading. Although the contribution of L1 literacy was statistically significant when L2 reading was measured with passage comprehension, the variance it accounted for was quite limited.

On the one hand, the findings of this study confirm the early research that L2 language proficiency contributes to around 30% of variance in L2 reading ability (Bernhardt, 2005; Berhhardt & Kamil, 1995), and L2 proficiency tends to be a stronger predictor of L2 reading than L1 reading ability, especially for learners who are not yet advanced (Bernhardt & Kamil, 1995; Bossers, 1991; Brisbois, 1995; Carrell, 1991; Lee & Schallert, 1997; Taillefer, 1996). The average score of 36% in TOEFL reading comprehension demonstrates that the participants in the current study are still at a low level of proficiency. As previous research shows, when learners are at a lower level of proficiency, they often rely more on their L2 language knowledge to facilitate their L2 reading comprehension, so L2 proficiency tends to play a greater role than does L1 reading ability.

On the other hand, the findings of this study failed to support the previous finding—that L1 literacy contributes between 14-21% of the variance in L2 reading (Bernhardt, 2005; Bernhardt & Kamil, 1995). There are two possible explanations for this outcome. First, Chinese orthography is very different from English orthography, and there are almost no morphological or vocabulary cognates between the two languages. It is possible that the strong difference in orthographic and lexical knowledge interfered with (or had no positive impact on) reading English. According to Brown and Haynes (1985), the automatization of the basic skills of L1 literacy can be of little or no use in L2 reading by being too specific and well established for the L1. Moreover, the automated low-level L1 processes may actually interfere with the acquisition or operation of emerging L2 skills when the writing systems of the two languages are very different. In other words, readers practiced in one writing system might experience positive transfer or negative interference from lower-level L1 reading skills when attempting to master a new system, depending on the similarities and differences between the skills fostered by each of the two systems, and also depending on L2 proficiency level (Brown & Haynes, 1985; Haynes & Carr, 1990; Koda, 2007).

Second, the measure of L1 literacy used in this study included both reading and writing, but most studies of this kind have tended to look at the role of L1 reading only. For this reason, the findings might not be directly comparable with previous studies. Another unique element about this study is that the measure of L1 literacy includes literacy in both modern Chinese and classical literary Chinese, which are equally emphasized in Chinese literacy education. However, including both types of literacy may have also altered the comparability of the findings of this study to other studies. In addition to orthographic distance between first and second languages, future research should also take into consideration the literacy tradition of the languages under investigation. Separate investigations of the relationships between the two types of L1 literacy

ability and L2 English reading will certainly shed light on the understanding of the role of Chinese L1 literacy in L2 reading comprehension. While the L1 literacy measure in this study may seem somewhat broad because it includes writing and literacy in classical literary Chinese as well as literacy in modern Chinese, the use of national exam results warrants a carefully developed and reliable L1 measure.

Another important observation of this study is that the types of L2 reading comprehension measures seem to have made a difference in the relative contribution of the predictor variables. When TOEFL reading scores were used as dependent variable in the analysis, the contribution of L2 proficiency was 27% and the contribution of L1 literacy was not significant, but when passage-comprehension scores were used as dependent variables in the analysis, the contribution of L2 proficiency rose to 35% (not counting the shared variance) and L1 literacy also had significant contribution. As mentioned earlier, the TOEFL reading-comprehension measure (with an average score of 36%) appeared to be more difficult than the researcher-developed measure of passage comprehension (with an average score of 61%), which might explain the discrepancy of the findings in this study regarding the two measures of L2 reading comprehension.

The findings of the study did not render support for the Linguistic Interdependence Hypothesis; neither did it provide enough evidence to support the existence of a language threshold. Previous studies have observed that once the readers become more advanced in their L2 proficiency, L1 reading ability becomes increasingly more important, thus leading to the successful transfer of L1 reading skills to L2 reading and a stronger relationship between L1 and L2 reading (Bossers, 1991; Brisbois, 1995; Carrell, 1991; Lee & Schallert, 1997; Taillefer, 1996). The participants in this study might not have yet reached the L2 language threshold level for L1 literacy knowledge to be beneficial to L2 reading performance. However, the lack of evidence warrants further research with Chinese EFL learners. It will be especially meaningful for future research to investigate these relationships with learners at different levels of L2 language proficiency and, even more importantly, longitudinal studies should be conducted to capture the dynamics in these relationships as learners' L2 language proficiency develops.

In conclusion, the previous finding that L1 literacy is an important predictor of L2 reading may not apply as well with the group of Chinese learners of English in this study. The current finding remains tentative until more research with similar participants and similar measures is conducted. Future research should also investigate the relationship between other orthographic languages and English. As Koda (2007) states, in order to understand the impact of prior literacy experience on L2 reading development, more research needs to be conducted with multiple languages that vary in linguistic distance from English.

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