

## **Reading in Developing L2 Learners: The Interrelated Factors of Speed, Comprehension and Efficiency across Proficiency Levels**

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### **Abstract**

*This study investigates L2 reading speed of developing readers. While L2 reading speed has been a topic of research, almost all studies to date investigate L2 adult learners and do not take into consideration samples of middle school students in the earlier stages of L2 development. Using data from a sample of 124 German eighth-graders, who range in their L2 reading proficiency from beginner to intermediate, we examined the patterns of reading speed, text comprehension, and reading efficiency in the students' L2 English and L1 German. Utilizing the Common European Framework of References for Languages (CEFR) to estimate students' proficiency levels (A1 to B2), we found that students with intermediate proficiency read faster and more accurately than students with beginner L2 proficiency. However, all students in the sample, on average, read with similar efficiency, the ratio of speed and comprehension. In addition, controlling for L2 proficiency, students who read faster in the L1 are more likely to read faster in the L2, on average, although the relationship of reading speed between the two languages is stronger when students read more slowly. The implications for teaching, curriculum development, and assessment are discussed.*

**Keywords:** reading rate, reading speed, reading fluency, L2 reading, reading comprehension, L2 proficiency, L1-L2 reading

Reading speed, one of the major building blocks of fluency, is an essential component for successful reading (Nation, 2005). Theoretical assumptions suggest that fluent readers are sufficiently fast and accurate in their word recognition that they have the attentional resources to focus on higher-level

comprehension processes (Gorsuch & Taguchi, 2008; Grabe, 2009; 2017) and ultimately more enjoyment in reading (Nuttall, 1996). This is assumed for both native (L1) and second language (L2) reading. However, it is widely acknowledged that individuals do not read as easily or quickly in their L2 as in their native languages (Alderson, 2000).

Despite its importance, reading speed as a central building block of L2 learning has been largely overlooked in the empirical literature (Grabe 2009, 2010). To date, most studies on reading speed focus on adult L2 learners (i.e., Chang, 2012; Fraser, 2007). These samples, which often come from university settings, already have developed advanced L1 reading skills, not to mention that they have more prior knowledge of how the target language works as a system as well as more self-awareness as language learners (Grabe & Stoller, 2011). It remains unclear if younger readers, who are still developing their mother tongue language skills and awareness of themselves as language learners, show similar patterns of L2 fluency and how their developing L2 proficiencies and L1 fluency skills affect these patterns.

In the present study, we seek to address this gap by investigating reading speed in an understudied population of L2 readers whose abilities span across a range of levels, from beginner to intermediate, and, as younger learners, are still developing their L1 language skills. In the following, we will first discuss the centrality of reading speed and its relationship to text comprehension and efficiency. Then, we explore how the association between L1 and L2 reading speed might differ across proficiency levels. Subsequently, we argue why current research potentially does not address important differences for developing readers.

## **Literature Review**

### **The Role of Speed, Comprehension and Efficiency in Reading**

Reading is a multifaceted activity that involves both lower-level and higher-level cognitive processes (Grabe, 2009; 2017; Koda, 2005; Perfetti, 1999; Pressley, 2006). Lower-level processes, like word recognition, syntactic parsing, and meaning proposition encoding, are the building blocks that support automatic and fluent decoding (LeBerge & Samuels, 1974). Higher-level processes allow the reader to use skills and strategies to understand meaning, interpret, make inferences and evaluate information in a text (Grabe, 2017). Although models of reading stress different paths toward fluent reading (cf. the *automaticity model* by LeBerge & Samuels, 1974 vs. the *interactive model* by Stanovich, 2000), there is agreement that lower-level processing needs to be largely automatic to free up cognitive resources for higher-level comprehension processes (for discussion, see Fuchs, Fuchs, Hosp, & Jenkins, 2001; Grabe, 2009). If lower-level processes are not automated and engage substantial attentional resources, the reader is unable to hold enough detail in the short-term memory to permit interpretation of the overall text. In other words, there may be little capacity for higher-level processes, hindering comprehension. Therefore, it is important for readers to have a certain amount of fluency to support accurate text comprehension (Kuhn & Stahl, 2003).

Reading fluency, the ability “to read text rapidly, smoothly, effortlessly, and automatically with little attention to the mechanics of reading such as decoding” (Meyer & Felton, 1999, p. 284), depends on maintaining a certain reading speed (Hudson, Lane, & Pullen, 2005; Grabe 2010). An effective reading speed supports comprehension of the text (Grabe, 2010). While reading speed and text comprehension may have a positive relationship (e.g., Segalowitz, 2000), it has also been argued that reading speed decreases comprehension, placing speed and comprehension in competition with one another (Brumfit, 1985; Champeau de Lopez, 1993; Carver, 1990). This may result from reading so quickly that it leads to ineffectual execution of low-level processes, resulting in reduced comprehension.

The combination of reading speed and text comprehension is reading efficiency (Carver, 1990; Geva & Zadeh, 2006). Also termed ‘effective reading speed’ (Jackson & McClelland, 1979), the notion of reading efficiency emphasizes the importance of lexical retrieval process and their effect of reading comprehension (Perfetti, 1985). While reading efficiency and fluency overlap to some degree, fluency incorporates a broader range of skills, while efficiency can be broken down to the product of speed and comprehension (Carver, 1990; Geva & Zadeh, 2006).

Despite differences, reading fluency and efficiency can both vary depending on a reader’s ability to process words automatically (Stanovich, 1980). This variation can be dependent on several factors, including age and proficiency (Chang & Millet, 2017; Grabe, 2009). Typically, younger readers have less automatic lower-level processes, like word recognition and word decoding, than older readers, who have greater capacity for word-recognition automaticity. This potentially assists to free up the working memory for higher-level reading processes, making it easier to achieve higher reading speed (Grabe, 2009). Indeed, it has been found that younger readers have slower reading speed than older readers and that reading speed increases on average of about 14 wpm every year (Carver, 1990). Furthermore, a proficient L1 reader normally reads at about 250-300 wpm, although this speed might differ depending on the difficulty of the text, the subject, and the type of reading.

In conclusion, effective reading demands a minimum speed to support the accurate comprehension of the text. These two elements, speed and text comprehension, affect overall reading efficiency. The elements of speed, text comprehension, and efficiency may depend on both age and language proficiency. In the following section, we will address if these patterns found in L2 reading mirror those in L1 reading.

## **L2 Reading Speed**

It is widely acknowledged that individuals do not read as easily or quickly in their L2 as in their native languages (Alderson, 2000; Favreau & Segalowitz, 1983; Fraser, 2007; Segalowitz, Poulsen, & Komoda, 1991; Raymond & Parks, 2002; Roberts & Felser, 2011). One possible reason for this difference is that L2 readers have different cognitive profiles in their L1. Specifically, L2 learners have more irregular patterns of fluency development and have less long-term memory in their L2 as in their L1 (Fraser, 2007). In L2 reading, more attentional control is needed to focus on new words, morphology, and syntax, which can result in a heavier processing load in the working memory (Taguchi, Melhem, & Kawaguchi, 2016; Segalowitz & Hébert, 1990) and slow down the reading process (Segalowitz & Hulstijn, 2005). These difficulties with lower-level processes can create a barrier to higher-level processes, resulting in slower L2 reading and affecting comprehension (Grabe, 2009).

As discussed above, reading speed and comprehension may complement each other or work in competition. In L1 reading, several studies found a positive relationship between reading speed and comprehension (e. g. Fuchs, et al., 2001; Hales et al., 2011; Jenkins, Fuchs, Espin, van der Beck, & Deno, 2000; National Reading Panel, 2000; Roberts & Felser, 2011; Pretorius & Spaul, 2016). However, this positive relationship does not appear to be equally strong at every stage of reading development, as there seems to be a strong association at lower levels in elementary school (Fuchs, Fuchs, Hamlett, Walz, & Germann, 1993) with the correlation decreasing as students advance through grades and as reading materials become more complex (Paris, Carpenter, Paris, & Hamilton, 2005).

Other studies have found evidence that improved L1 reading rate does not always result in improved comprehension (Rashotte & Torgeson, 1985; Wexler, Vaughn, Edmonds, & Reutebuch, 2008). For

example, in a study with 86 sixth and seventh graders, there was no significant association between text reading speed and comprehension which may reflect the decreased association between speed and comprehension found after elementary school (Hale, Skinner, Wilhoit, Ciancio, & Morrow, 2012). Similarly, fourth-, fifth-, and tenth-grade L1 readers who read selected passages faster had, on average, lower levels of comprehension (Skinner, Williams, Morrow, Hale, Neddenriep, & Hawkins, 2009). This conflicting evidence might be due to the varying instruments used across the studies to measure speed and comprehension as well as the proficiency levels of the samples.

For L2 reading, there has been a dearth of studies investigating the relationship between speed and comprehension. For beginning L2 readers, an increase in reading speed seems to be associated with an increase in comprehension (Chang & Millett, 2015; Taguchi & Gorsuch, 2002; Taguchi, Takayasu-Maass, & Gorsuch, 2004). Investigating the effect of a repeated reading intervention, Chang and Millet (2013) found that with a sample of 26 intermediate college students, improved reading speed was associated with improved comprehension (also see Shimono, 2018). Several other intervention studies with college students concluded that improved reading speed was not associated with a change in comprehension (Chang, 2010; 2012) finding no association between the components. In a reading intervention study with English as a Second Language (ESL) university students, improvement in reading rate was associated with a decrease in passage comprehension (Cushing-Weigle & Jensen, 1996). One reason for divergent results may be due to the fact that, similar to L1 students, the samples varied in their L2 proficiency.

Investigating reading efficiency, or the ratio of speed and comprehension (Carver, 1990), may shed light on lack of consensus in the aforementioned studies. While a few studies have explored L1 reading efficiency and found it to be a strong predictor of reading comprehension, no known studies to date have examined efficiency in L2 reading.

### **The Relationship Between L1 and L2 Reading Speed**

An important factor that might further explain L2 reading speed is L1 reading speed. Current evidence substantiates that L2 language learners read more slowly than L1 readers of the same language (i.e. Cushing-Weigle & Jensen, 1996; Haynes & Carr, 1990). For within-subject design studies, results show as much as a 30% difference in speed between the two languages (Segalowitz, Poulsen, & Komoda, 1991). With a sample of 95 fluent bilinguals who spoke L1 Chinese speakers learning English, Fraser (2007) found a substantial gap between L1 and L2 reading speed. Furthermore, the study found that there was more variability in L1 reading speed than in L2 reading speed, indicating a possible decreased efficiency in L2 reading. Other studies found that as L2 proficiency decreased, the gap in speed between the languages increased (Favreau & Segalowitz, 1983), indicating a potential nonlinear relationship between L1 and L2 reading speed.

In sum, L1 reading speed appears to be an important factor that helps explain L2 reading speed. However, current research has yet to investigate the interrelatedness of all these constructs together especially the possibility of a nonlinear relationship between L1 and L2 reading speed. All known studies to date have investigated their research questions with samples of adult participants, who have a high level of L1 and L2 fluency. In addition, the lack of standardized proficiency measures has made generalizations impossible for the classroom as well as testing situations.

### **The Current Study**

Despite the relatively few studies investigating L2 reading speed, current empirical research has made important first steps in exploring patterns in reading speed. However, to date, the majority of studies have used samples of adult learners, who are already fluent L1 readers. More research is needed with varying samples, specifically with individuals of younger ages and those whose L2

reading proficiency ranges from the beginner to intermediate level. Further, it is important to use statistical methods that allow not only to see descriptive trends in the sample but also the possibility to make inferences about a larger population of L2 learners. Lastly, because proficiency could affect the patterns in reading fluency and L2 populations are extremely varied (Grabe, 2009), it is imperative to use a standardized metric of L2 proficiency in order to generalize for language testing as well as classroom practices. Based on the general dearth of research on L2 reading fluency and more specifically on current gaps in the literature, we asked the following research questions:

RQ1: Does L2 reading speed and L2 text comprehension differ across proficiency levels as measured by the CEFR? Do students with different L2 proficiency levels differ in their reading efficiency?

RQ2: What is the association between L2 and L1 reading speed for students still developing their fluency skills in both languages?

## Methods

### Participants

Conducted in September 2012, the Institute for Educational Quality Improvement (IQB) sampled 126 eighth-graders from three randomly selected schools in three German federal states. The schools represented three different school tracks: lower vocational track (27%), middle vocational track (31%), and university-bound track (42%). 64 (52%) were girls (five students did not indicate their gender). The students' age ranged between 13 and 16 years ( $M = 14.84$ ,  $SD = 0.87$ ). None of the students were English native speakers, about 90% spoke only German at home and almost 10% spoke mainly German plus another language (not English). All students in the sample had German as their L1 and English as their L2. The two students who indicated that they spoke mainly a language other than German at home were excluded from further analysis ( $N_{final}=124$ ).

### Measures

**L2 reading speed, text comprehension and efficiency.** To estimate the students' English *reading speed*, we administered a 20-minute test with eight authentic texts. We presented students with all texts consecutively. Figure 1 shows an example of a sample task with authentic text and comprehension questions. For each text, we stopped them after 30 seconds, and asking them to mark how far they read with a slash in the text (/), we counted the number of read words to measure the student's *reading speed*. During pilot testing, students were asked to stop and mark how much they had read after one minute. Students tended to complete the text, resulting in a ceiling effect. Because of this, we decided to reduce the allotted time from one minute to 30 seconds. To avoid possible metric inflation, all English reading speed results will be presented in words per 30 seconds (words/30s). After marking how far they had read in the text, participants were given an additional two minutes to complete the reading of the text and answer multiple-choice questions addressing the text. The students' English *comprehension* was operationalized as the percentage of comprehension questions answered correctly. After answering the comprehension questions, the students were presented with the next text. The position of the texts was rotated to create four different booklets to minimize individual affective and task placement effects. To measure *reading efficiency*, we computed a reading rate equivalent to that of Skinner and colleagues (2009), which was the percentage of comprehension questions answered correctly (*comprehension*) divided by the number of words read in 30 seconds (*reading speed*).

## Hurricane Victims

**Read the text. Then answer the questions below using 1 to 5 words / numbers. There is an example at the beginning (0).**

By Patrick Abbott

National Geographic Kids News

September 22, 2005

News stories about Hurricane Katrina have talked about the human victims along the heavily damaged U.S. Gulf Coast. But rescue actions are also necessary for the thousands of dogs, cats, and other animals that are on their own after the storm.

Many pets are without their owners because some rescue workers and shelters refused to take in pets for a variety of reasons.

Several organizations are trying to save these ownerless animals. The Humane Society of the United States is asking for more help from police in the affected regions "to save the thousands of stranded and abandoned pets still out there."

[...]

0. What was the name of the hurricane that destroyed a large area along the U.S. Gulf Coast?



Katrina

1. What is the name of an organization that cares for the animals left behind in the hurricane?



2. Who did the relief organization ask for more help?



**Figure 1. Example of Task (as published by Leucht, Retelsdorf, Möller, & Köller, 2010).**

**L2 reading proficiency in English as a first foreign language (CEFR reading test).** We administered a 20-minute paper-pencil test of 30 tasks aligned the German National Educational Standards (NES) developed by the Institute for Educational Quality Improvement (IQB) based on the Common European Framework of References for Language (CEFR) (Council of Europe, 2004). The standardized tasks were developed, calibrated, and validated by the IQB in order to assess English as a first foreign language in German secondary schools (Harsch, Pant, & Köller, 2010; Rupp, Vock, Harsch, & Köller, 2008). The tasks had a variety of subjects as well as formats. In a previous standard-setting study based on a large nationally representative sample and international experts, cut-scores were set that divided the scale of all tasks transformed IRT difficulty parameter into stages that correspond to the CEFR levels (Harsch, Pant, & Köller, 2010). Five plausible values (PVs) were generated using the generalize item response modeling software, *ConQuest* (Wu, Adams, Wilson, & Haldane, 2007) and pooled according to Rubin (1987) to create a composite English reading proficiency.

**L1 German reading fluency test for 6-12 graders (LGVT6-12).** We administered the standardized LGVT6-12 to estimate students' German reading speed (Schneider, Schlagmüller, & Ennemoser, 2007). This test consists of a single text of 1,727 words with imbedded word choice questions to estimate text comprehension. Students were asked to read and fill in the correct words within a four-minute period. Because of the differences between the instruments for L1 and L2 reading speed, we report L1 reading speed as standardized percentiles to avoid direct comparison.

## **Procedure**

The data were collected in a classroom setting administered by independent test administrators during a normal school day. The administrators read the standardized instructions of each section to the students before the beginning of each section. First the students completed the English proficiency test followed by the reading speed and comprehension test. After a five-minute break, the German *LGVT6-12* was administered followed by a student questionnaire. With instructions and break, it took approximately one hour to complete the entire test booklet.

## **Statistical Analysis**

To investigate reading speed in L2 learners, we first computed descriptive statistics to appraise the dependent variable L2 reading speed as well as the independent variables. Then, to address our first research question, we computed descriptive statistics by students' proficiency levels. Finally, to address our second research we fit a series of regression models to explain L2 reading speed. The descriptive statistics were computed using Stata (StataCorp, 2007). The regression analyses were conducted in R 3.1.2.

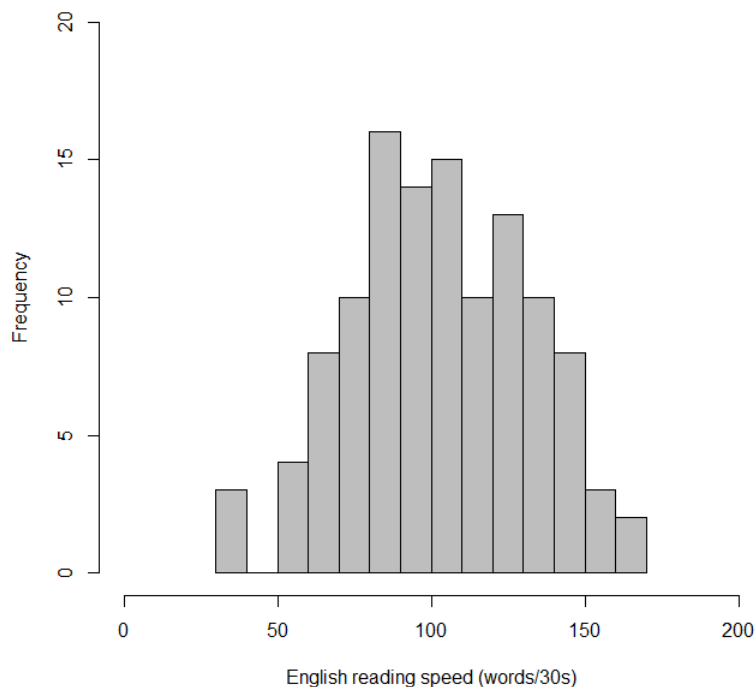
## **Results**

### **Descriptive Statistics**

To investigate reading speed in L2 learners, we examined L2 reading proficiency, the dependent variable L2 reading speed, L2 comprehension, as well as L1 reading speed in our sample.

First, we examined the distribution of L2 reading proficiency in our sample as measured with the CEFR reading test. The mean of the five plausible values for L2 reading ability ( $M = 462$ ) indicates that our sample of eighth-graders did not perform as well as the national population of German ninth-graders ( $M = 500$ ,  $SD = 100$ ) but had a similar variance ( $SD = 97.65$ ). The distribution in the sample of the students' English reading proficiency ranged between CEFR levels A1 and B2. Most students had a reading level of A2 ( $n = 52$ ) or B1 ( $n = 36$ ) with several performing at an A1-level ( $n = 30$ ) and very few reaching a B2-level ( $n = 6$ ).

For the dependent variable L2 reading speed, the descriptive statistics show that all students in the sample read, on average, 103 words per 30s ( $SD = 29$ ). Reading speed was almost normally distributed across the sample with no floor or ceiling effects (see Figure 2).



**Figure 2. Distribution of L2 (English) Reading Speed (words/30s) in the Sample.**

We next estimated descriptive statistics for L2 comprehension. Students' comprehension ranged from 0.17 to 0.83 percent ( $M = 0.50$ ,  $SD = 0.16$ ) and also appeared to be normally distributed with no floor or ceiling effects.

Finally, we examined the descriptive statistics for L1 reading speed. The L1 reading percentiles were distributed normally in the sample with a mean of  $M = 53.53$  and a standard deviation of  $SD = 10.67$ , reflecting a slightly faster reading speed and variance than the eighth-graders in the reading speed norm study ( $M = 50$ ,  $SD = 10$ ).

### **L2 Reading Speed, Comprehension, and Efficiency**

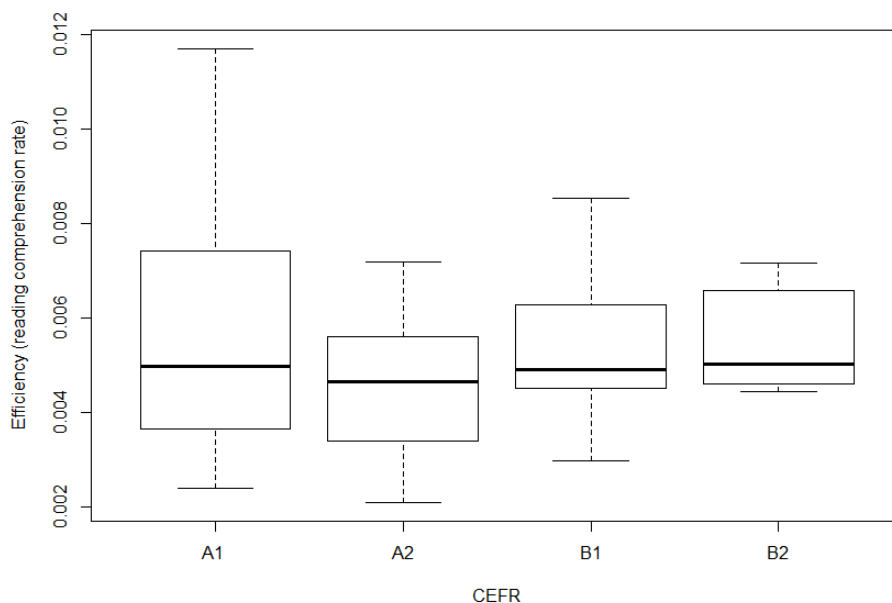
Given our substantive interest in L2 reading speed and comprehension across proficiency levels (RQ1: *Does L2 reading speed and L2 comprehension differ across proficiency levels as measured by the CEFR?*), we first considered L2 reading speed, comprehension and efficiency for L2 proficiency levels A1 to B2 (see Table 1). As shown, there is a progressive increase in L2 reading speed from levels A1 to B1 with no substantial difference between L2 reading speed for B1 level and B2 level students. Students at beginner levels (A1 and A2) have a larger variance (as shown with the standard deviation) in their reading speed than students at the intermediate levels (B1 and B2). There is a noticeable increase in the percentage of L2 comprehension for students across the four proficiency levels with similar variances across the four groups.



**Table 1. Sample means (and standard deviations) of L2 Reading Speed, Comprehension, and Efficiency across CEFR Levels.**

	A1 n = 30	A2 n = 52	B1 n = 36	B2 n = 6
L2 reading speed	77.11 (24.93)	105.68 (28.04)	115.94 (21.97)	114.58 (17.19)
L2 comprehension	0.39 (0.15)	0.47 (0.15)	0.60 (0.10)	0.63 (0.15)
L2 efficiency	0.01 (0.003)	0.01 (0.001)	0.01 (0.001)	0.01 (0.001)

Next, to address the second part of our first research question (*Do students with different L2 proficiency levels differ in their reading efficiency?*), we combined the factors of L2 reading speed and comprehension, estimating L2 reading efficiency (see Table 1). Students across proficiency levels have similar efficiency in their reading, on average. However, there is a larger efficiency range for students at the A1 proficiency level compared to students at the other reading proficiency levels. To test for difference in efficiency across proficiency groups, we conducted Tukey’s HSD test. We found no statistically significant differences between efficiency across proficiency levels indicating that the ratio between speed and comprehension is similar across different L2 proficiency levels. Figure 3 illustrates the lack of difference in mean L2 reading efficiency across proficiency levels. However, it shows how students who are reading at an A1 level have a wider variation of efficiency compared to their peers with higher L2 proficiency.



**Figure 3. Boxplots of L2 Reading Efficiency across Proficiency Levels.**

## L1 and L2 Reading Speed

To investigate the relationship between L1 and L2 reading speeds (RQ2: *What is the association between L2 and L1 reading speed for students still developing their fluency in both languages?*), we estimated a series of linear regression models with L2 reading proficiency groups (A1 to B2) as a series of ‘dummy’ variables and students with A1 reading proficiency as the reference group and a combined B1/B2 group due to the small sample size of the B2 group (see Table 2). In Model A, we regressed the variable L2 reading speed on the L2 reading proficiency groups. As shown in Model A, students in the A2 and B1/B2 proficiency group read significantly faster than their peers in A1. This suggests a positive trend between proficiency and speed for beginner and intermediate readers. Reading proficiency group membership explained just about one quarter (24%) of the variance of L2 reading speed in the sample.

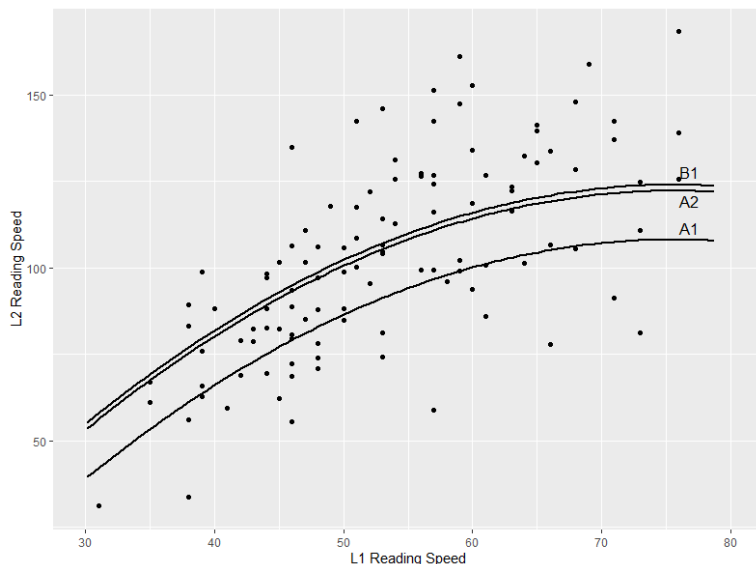
**Table 2. Multiple Regression Models Explaining L2 Reading Speed**

	Model A	Model B	Model C			
Intercept	77.105***	5.01	3.28	9.96	-103.43*	45.39
L2 reading proficiency A2	28.58***	6.16	18.49***	4.97	16.55**	4.93
L2 reading proficiency B1/B2	38.64***	6.33	21.31***	5.33	18.55***	5.34
L1 reading speed			1.58***	0.19	5.65**	1.70
L1 reading speed <sup>2</sup>					-0.04*	0.02
Adjusted R <sup>2</sup>	0.24		0.52		0.54	

In Model B, we added our question predictor, L1 reading speed, to the model. Controlling for L2 reading proficiency, L1 reading speed explained an effect in addition to L2 reading proficiency ( $\beta_{L1ReadingSpeed} = 1.58, p < .001$ ). The addition of L1 reading speed in Model B results in a 28% increase in explained variance. The results show that students who read faster in their L1 also read faster in the L2, even after controlling for their L2 reading proficiency.

Finally, as indicated in previous studies with descriptive statistics, we added a quadratic term to explore whether the relationship between L2 and L1 reading speed is linear (Model C). The addition of the L1 reading speed quadratic term revealed a significant nonlinear relationship between L1 reading speed and L2 reading speed ( $\beta_{L1ReadingSpeed^2} = -0.04, p < .02$ ). This model resulted in the best model fit explaining 54% of the overall variance in L2 reading speed.

Figure 4 depicts Model C, illustrating the quadratic relationship between L1 reading speed and L2 reading speed for A1, A2, and B1/B2 students. This shows that, controlling for L2 proficiency, students who read faster in their L1 also read faster in their L2. However, the effect of L1 reading speed is greater for those students who read more slowly. The faster students read in their L1, the less the reading speed in their two languages are related. In other words, the effect of change in L1 reading speed is greater for students with slower L2 reading than for students with faster L2 reading.



**Figure 4. Nonlinear Relationship between L1 Reading Speed (in Standardized Percentiles) and L2 Reading Speed (words/30 secs).**

## Discussion

In the present study, we examined L2 reading speed in a sample of beginning and intermediate L2 middle school readers. Specifically, we investigated two research questions: (a) if L2 reading speed, comprehension, and efficiency differ for students across L2 proficiency levels; and (b) to what extent L2 and L1 reading speed are related. To this end, we first analyzed the association between L2 reading speed and comprehension and additionally built a composite of reading speed and comprehension to compare efficiency across the different proficiency levels. Then, to answer the second research question, we specified linear regression models to evaluate the relationship between L1 and L2 reading speeds.

The results provide evidence that L2 reading speed and L2 comprehension differ systematically across proficiency levels. As predicted, students who have higher L2 proficiency read faster and more accurately than students with lower L2 proficiency. The descriptive statistics foreshadowed that positive association found between L2 reading speed and comprehension. These results reinforce the theoretical assumption that individuals at the beginning of L2 learning focus more attention on their lower-level processes slowing down their reading (i.e. Segalowitz & Hulstijn, 2005). As their ability increases, these processes become more automatic resulting in increased fluency. These findings parallel those reported by Taguchi and colleagues (Taguchi & Gorsuch, 2002; Taguchi et al., 2004), who also found a positive association between speed and comprehension in beginning L2 adult readers. Similarly, the findings of the present study reflect those of Chang and Millet (2013) who also found a positive relationship between L2 reading speed and comprehension in intermediate L2 readers. At the same time, they contrast with the results found in more advanced language learners (Chang, 2010; 2012; Cushing-Weigle & Jensen, 1996). Taken together, these findings suggest that there may be a stronger association between reading speed and comprehension at earlier stages of language learning. Similar to L1 reading, as students develop their skills in L2 reading and the reading materials become more complete (e.g., Paris et al., 2005) there appears to be less of a relationship between reading speed and comprehension.

To examine if students with varying L2 proficiency levels differ in their L2 reading efficiency, we constructed a composite efficiency measure of the ratio of text comprehension to speed. We found

that students across the sample read with similar efficiency. That is to say, the ratio between how fast a student reads and how much they understand of the text is similar to whether they are beginning (A1 or A2) or intermediate learners (B1 or B2) on average. This suggests that as students advance with their foreign language learning, their reading speed and comprehension skills develop analogously. However, it should also be noted that students at the beginner levels had a slightly larger range of efficiency than students at the intermediate level. While not statistically significant, this larger variation may indicate that there is a fluctuation period with more variability in skills for some beginning language learners. As this is, to our knowledge, the first study to examine this question with L2 readers, these results provide a basis for further research with varying populations of students and should be viewed as explorative.

Addressing our second research question, we examined the relation between L1 and L2 reading speed. As expected, there is a strong relationship between L1 and L2 reading speed. Even after taking L2 reading proficiency into account, L1 reading speed is a significant predictor of L2 reading speed. This is similar to the findings of Fraser (2007), who also found a strong association between L1 and L2 speed across different types of reading tasks. In addition to the strong linear association between L1 and L2 reading speed, the analysis showed a significant nonlinear relationship between L1 and L2 reading speed, even after controlling for L2 reading proficiency. The results indicate that for students who read more slowly, there is a stronger relationship between L1 and L2 reading speed. For students who read faster, there is less of a relationship between reading speed in their L1 and L2. One possible hypothesis that could explain these findings may be that beginner L2 students rely more on L1 transferrable skills and processes (i.e., vocabulary similarities, making inferences about meaning from one language to another) than later in their language learning when they have stronger language specific L2 skills, which is mentioned in the findings of Faveau and Segalowitz (1983).

Taken together, these results have several implications for reading in a foreign language learning as well as foreign language testing. This study provides a first step in creating benchmark reading speeds in L2 English reading according to the CEFR. Educators and test developers may now begin to estimate how much time to allow for a student to complete a task, whether in an assessment situation or in the classroom. Secondly, the positive association between L2 reading speed and comprehension found in this study can inform explicit fluency training in the L2 classroom. Fluency training can help a student, not only improve their skills in testing situations but their overall L2 comprehension, especially at the beginning stages of development. Finally, because of the strong relationship found between L1 and L2 reading speed, foreign language teachers should be aware of a students' L1 reading profile. By identifying and supporting struggling L1 readers, foreign language educators are also supporting successful L2 learning.

Despite the importance of these findings, our study has several limitations. The contrasting measures of reading speed between the two languages created barriers when interpreting the results. Because of the importance of using authentic texts, which ranged from beginner to independent levels in difficulty, and to avoid a ceiling effect, our time metric for speed was 30 seconds. Interpretations should be made with caution when generalizing about the raw score of how fast students can read, as we cannot assume that students will read double the number of words in a one-minute period of time. This differs greatly from the L1 German standardized measure, which uses only one text with imbedded vocabulary. The measure of German speed and comprehension allowed for sustained reading over several minutes and then estimating the average speed across four minutes. With the imbedded vocabulary, it forced the student to break their fluent reading to answer a question. Additionally, the absolute value of the English measure should be interpreted

with caution as a probable overestimate of reading speed. For these reasons, it is important not to interpret the average speed (wpm) in English and German in direct comparison to each other.

Another limitation is the small sample size of B2 readers. The relatively small sample size of the B2 group compared to the other ability groups makes it difficult to draw conclusions about students in the upper ability level of the sample. While this study provides an important step in investigating reading fluency in a foreign language, future research should utilize larger samples with more robust subgroups across a wider proficiency range.

Another important avenue for further research should focus on longitudinal investigations to examine how individual students develop their reading fluency over time. As the current study consists of students with different abilities, we cannot make inferences about growth in L2 reading. A longitudinal investigation could provide solid evidence to identify the most important time to implement fluency training in the L2 classroom. Through this, educators could develop curricula to optimize the development of students' L2 reading. This can have sustainable effects not only on students' actual reading skills but also on their motivation and enjoyment of reading in a foreign language.

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