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Reading Rate of Academic English Texts: Comparing L1 and Advanced L2 Users in Different Language Environments

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Abstract

Slower reading in a second language (L2) has been attributed to lower proficiency and/or to slower language processing. This study investigates the role of linguistic context in L1 and L2 academic reading speed among 295 undergraduate Psychology students who all read English language texts at university. The aim was to compare academic reading among students in a predominantly English-speaking environment (the UK) with those in a parallel language context where both English and the local language are used in teaching (Norway). Three groups were tested: Norwegian students in Norway, and both L1 and L2 English-users in the UK. Participants completed a timed academic reading task, followed by comprehension questions. Although all three groups achieved similar mean scores on the comprehension questions, the L1 and L2 English-speaking students in the UK read the text significantly faster than the Norwegian students. There was no significant difference between reading times for the L1 and L2 readers in the UK, indicating that the difference was not simply a consequence of L2 reading. Additionally, in contrast to previous research on groups with lower L2 proficiency, this study found no significant association between reported extramural English exposure and reading speed in either L2 group. The results indicate that advanced L2 readers in a parallel language environment may need more time to read academic texts in L2 compared to L1 readers and L2 readers in an immersion context, which has implications for the time and support needed by these students.

Keywords: reading rate; academic reading; L2 reading; extramural English; advanced L2 users; English as a second language

1. Introduction

The status of English as an academic lingua franca means that advanced English proficiency is a prerequisite for most non-native English speakers undertaking university education. Students with English as a second language (L2) need to develop the ability to read university textbooks produced primarily with native English-speaking (L1) students in mind (Graddol, 2006) whether they are studying in an English-speaking country or in their own. Reading fluency is an important aspect of skilled reading (Beglar & Hunt, 2014; Grabe, 2009) and can be defined as ‘the ability to

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read rapidly with ease and accuracy' over extended periods of time (Grabe, 2009, p. 291). Reading fluency develops with experience, and reflects processing speed (Grabe, 2009) because it entails the automatization of a number of complex processes, from lower-level linguistic processes such as decoding, to higher-order skills necessary for comprehension (Geva & Yaghoub Zadeh, 2006). Research has found that L2 reading tends to be slower than L1 reading, even for highly proficient L2 readers (Cop, Dirix, Drieghe, & Duyck, 2017; Cop, Drieghe, & Duyck, 2015; Fraser, 2007; Shaw & McMillion, 2008, 2011), which means that many university students may struggle to read the required volume of text throughout the course of their studies. Additionally, slower L2 reading may make students less motivated to read difficult texts (Pecorari, Shaw, Malmström, & Irvine, 2011; Ward, 2001). This study aims to investigate L2 reading speed of academic text in a parallel language environment, where both English and the local language are used in university teaching, asking whether the linguistic context affects reading speed in students who can be assumed to be advanced L2 users. Differences in reading speed are generally attributed to lower proficiency in the L2 and/or to slower processing, as will be discussed below.

1.1 Proficiency

The relationship between reading speed and comprehension appears to depend on the proficiency of the reader. Among less experienced readers, reading fluency and comprehension are strongly linked (Jackson, 2005), which may be due to limitations on working memory (Biancarosa, 2005) and because cognitive resources are directed to word recognition and other lower level processes instead of overall comprehension (Stanovich, 1980). However, the relationship between fluency and comprehension is much more independent among skilled readers (Jackson, 2005). Gaps in vocabulary and topic knowledge can be overcome using compensatory strategies, but the main cost appears to be time (Walczyk, 2000). Studies of Swedish university students, who are advanced L2 users and expected to read English texts written for native speakers, have shown that they can reach similar levels of comprehension to L1 readers, although they need approximately 25% more time for it (Shaw & McMillion, 2008, 2011). In time-limited situations such as exams, this slower speed could result in lower comprehension scores, giving the appearance of poorer comprehension (Shaw & McMillion, 2011; Walczyk, 2000).

L2 proficiency is strongly correlated with L2 exposure, and activities outside the classroom (extramural input) have been shown to be very important for L2 acquisition (see, for example, Nation, 2015; Peters, 2018; Sylvén & Sundqvist, 2012). Researchers have recommended practicing reading as a way to improve L2 reading speed (Anderson, 1999; Beglar & Hunt, 2014; Rayner, Schotter, Masson, Potter, & Treiman, 2016) and research shows that extensive reading programs are associated with improved reading speed in lower proficiency L2 readers (Beglar, Hunt, & Kite, 2012; Bell, 2001; McLean & Rouault, 2017; Robb & Susser, 1989), presumably as a result of improving L2 proficiency. However, studies have found that among advanced L2 users, there is no correlation between reading speed and L2 proficiency (Cop et al., 2015; Fraser, 2007), and little is known about the relationship between extramural input and reading speed in advanced L2 readers.

1.2 Processing

Slower L2 reading speeds have also been attributed to slower processing in the L2. Reading in L2 is inherently more complex than reading in L1 since both reading ability and L2 proficiency are required, and since there are two interacting languages involved (Carrell, 1991; Koda, 2007). Research has demonstrated that both languages are active in bilinguals during language perception and production, even in situations where only one language is required (Kroll, Gullifer, & Rossi, 2013; Van Assche, Duyck, & Hartsuiker, 2012; Van Hell & Tanner, 2012). This may slow down processing speed in all bilinguals, especially those who have acquired an L2 later in life, since the speed of lexical access depends on both language proficiency and the number of times readers have encountered vocabulary items (Tanabe, 2016).

Syntactic processing has also been found to differ in monolinguals and bilinguals, possibly partly because of difficulties in lexical processing (Hopp, 2016). Differences in processing found even in very proficient L2 speakers compared to monolinguals may stem from different memory systems underlying L1 and L2 (Paradis, 2009; Ullman, 2001), from L2 speakers not processing syntactic detail the same way that L1 speakers do (Clahsen & Felser, 2006), or from limitations in working memory capacity or lack of automatization (Hahne, 2001; Hopp, 2010; McDonald, 2006). Cunnings (2017) argues that differences may be a result of L2 users experiencing more interference in memory retrieval of information

constructed during sentence processing, in particular relying more on discourse-level cues, and that this may in itself be a result of slower reading speed. Thus, slower reading speed may be both a cause of and a result of different syntactic processing in an L2. However, differences in processing have been found even when reading speed was the same in native speakers and L2 users (Felser & Cunnings, 2012).

Differences between L1 and L2 reading can also be seen in eye tracking studies. Cop et al. (2015) found longer sentence reading times, more fixations, shorter saccades and fewer instances of word skipping among L2 readers compared to L1 readers. The authors describe the reading patterns of L2 readers in their study as more ‘child-like’ than those of the L1 readers, perhaps reflecting a lack of experience in reading in L2 compared to L1. None of these effects were found when the bilinguals were compared while reading in their L1 to monolinguals, implying that these differences between L1 and L2 reading are not a general effect of bilingualism.

There is also evidence that language context affects processing speed. Fraser (2007) tested reading rates in Chinese participants reading in L2 English. She found that participants living in an English-speaking environment read faster in English than those living in China, even though both groups had similar scores on an English proficiency test. This may be at least partly explained by the frequency with which the L2 is used compared to the L1; Linck, Kroll, and Sunderman (2009) found that language learners in an immersed L2 setting were able to more successfully inhibit their L1 and consequently performed better on tasks of L2 verbal fluency and experienced less translation interference than those in a non-immersion setting. Therefore, the extent to which the L2 is used relative to the L1 may also play a role in L2 processing speed.

1.3 Reading for university

Text type can affect reading (Alderson, 2000), and academic texts can present particular challenges to fluency, since academic language tends to use complex grammatical constructions and specific vocabulary (Coxhead, 2000; Gardner & Davies, 2014) that can be an obstacle to reading fluency and comprehension in otherwise fluent readers (Snow, 2010). Word-identification ability has also been shown to predict reading fluency (Kuperman & Van Dyke, 2011), as has the reader’s familiarity with the words in the text (Rayner et al., 2016), which means that academic

language may also affect reading speed. Problems caused by slow reading compound over time when a lot of reading is required. Although most tests of reading speed have been conducted on short texts (Brysbaert, 2019), eye tracking studies have also found slower reading rates in L2 readers even over the length of an entire novel (Cop et al., 2017; Cop et al., 2015). The difference in reading speed was larger in longer compared to shorter sentences, which Cop et al. (2015) hypothesize may have to do with longer sentences being syntactically more complex. This could imply that L1-L2 differences can be expected to be even larger for academic reading than for reading novels. Pecorari et al. (2011) report that many Swedish university students who study in L2 English find the amount and difficulty of English language textbooks an impediment to learning.

With similar learning expectations for L1 and L2 readers, and a finite amount of time for reading, it is important to gain a better understanding of academic L2 reading in order to identify possible challenges that university students with L2 English may encounter. Research on reading speed has focused mostly on readers with lower L2 proficiency, and while proficiency and reading speed are highly correlated for lower proficiency L2 users, research has shown no correlation between these among advanced L2 readers. Also, although L2 reading has been shown to be slower than L1 reading, and although linguistic context appears to affect reading speed, little is known about how L2 reading in a parallel language environment compares to a monolingual environment, which is important to our understanding of the underlying processing in L2 reading and of the implications of previous research for parallel language situations. While extensive reading has been shown to improve reading speed among lower proficiency L2 learners, little is known about the effects of extramural reading on advanced L2 readers. Furthermore, to the best of our knowledge, no research has directly addressed reading rate of academic text, which is surprising since we know that text type affects reading (Alderson, 2000). The current study aims to contribute towards filling these gaps in our understanding of advanced L2 academic reading by investigating reading rate among advanced L2 users in monolingual and parallel language environments using an authentic academic text to measure and compare their performance with that of L1 student readers of English.

1.4 The context for the current study

The current study investigates reading speed and comprehension in Norwegian undergraduate Psychology students compared to native and non-native English speakers in the United Kingdom. Universities in native English-speaking countries generally require non-native English-speakers to prove their English proficiency as part of the admission requirements, whereas Norwegian students are not required to pass any specific tests of English proficiency to be admitted to Norwegian universities, as it is expected that they have the skills they need to read academic English texts in upon completing secondary school (Hellekjær, 2009). Given that both Norwegian and English are Germanic languages with many cognates, Norwegians may have some advantages over other L2 English learners with less closely related L1s. Norwegians have some of the highest levels of L2 English proficiency in the world (Bonnet, 2004; Education First, 2020), and learn English from the first year of school until at least year 11. They are also extensively exposed to English through media and other leisure activities, which has been shown to be positively associated with English reading ability (Brevik & Hellekjær, 2018) and vocabulary knowledge (Busby, 2020).

In Norwegian universities, students are generally expected to read texts and understand lectures in both Norwegian (L1) and English (L2). This is commonly described as ‘parallel language use’ since both languages exist in the same domain and are used in parallel (Hultgren, 2014). Psychology students are relatively representative of this parallel language situation. Most Psychology classes in Norway are taught in Norwegian but use English language textbooks and articles in their curricula. Students are expected to read academic journal articles in English by their second year of bachelor level studies. They thus fit McMillon and Shaw’s (2016) description of ‘advanced L2’ users who read at levels close to those of their L1 equivalents and are subject to similar expectations. However, their parallel language situation differs from that of students in a true English immersion setting, where English is the main language both for all aspects of university activity and for the community in which the students live, regardless of what language they use at home. Although extramural exposure has been shown to be significantly associated with English vocabulary knowledge in this non-immersed population (Busby, 2020), the question remains as to whether the amount of input received in non-academic settings would have a significant effect

on academic reading speed. This study aims to investigate academic English reading rate among Norwegian university students in a parallel language environment compared to those in a predominantly English-speaking environment using an authentic academic text. Specifically, we investigated the following research questions:

1. How does reading speed compare between L1 English students, L2 English students in the UK, and L2 English students in a non-immersion setting?
2. How does reading speed relate to reported extramural English exposure in advanced L2 users in an immersion and a non-immersion setting?

2. Methods

2.1 Research design

This quantitative study collected data through an online survey comprising a reading task and a battery of questions about participants' language, education and reading experiences. Participants completed the survey on computers or mobile devices. Focus was on how students with different language backgrounds read academic texts. Therefore, the text for the reading task had to reflect what they would read for university without being too time-consuming. For this reason, the reading task was an extract of an authentic academic journal article rather than an existing test written or modified by researchers.

The project was registered with the Norwegian Centre for Research Data (NSD) and a data processing agreement between the survey provider and the research institution ensured secure handling of information.

The survey comprised 3 sections: the reading task, questions to check the applicability of the task to the students' typical university reading experience, and background questions. These sections are described below.

2.1.1 The reading task

Participants were presented with an extract of a text taken from a scientific journal article entitled "Wild capuchin monkeys adjust stone tools according to changing nut properties" (Luncz et al., 2016). The text was

1,415 words long and discussed monkey behaviour, selected with the aim of being interesting to the participants without requiring prior knowledge or familiarity with subject-specific vocabulary. This text was longer than those used in most studies of reading speed (Brysbaert, 2019) and comprehension (Johnston, 1984; Urquhart & Weir, 1998), which is important for enabling the use of different types of reading strategies (Urquhart & Weir, 1998), for giving a reliable and stable measure of reading speed (Brysbaert, 2019), and for reflecting the type of reading students encounter at university.

The text was presented on three pages of the online survey (555, 464 and 396 words on each page, respectively) to give an impression of realistic text density but enabling the recording of reading time for each page individually. This was recorded by the survey program. Participants were instructed to read carefully because they would need to answer some comprehension questions about the text and to move to the next page once they felt that they had understood the text. Before starting, they were informed that they would not be able to go back and read the text again.

After finishing the text, participants were asked eight multiple-choice comprehension questions (each with four possible responses) to check that they had understood the content. The questions were designed to test understanding of the overall message, inferences about the information in the text, as well as more specific details (some of which were paraphrased). The questions were presented in randomised order, and pilot testing on native and non-native English-speakers ensured that the questions provided a suitable challenge and could not easily be answered without having read and understood the text.

Since familiarity with vocabulary (best indicated by vocabulary frequency) is known to affect reading fluency, the vocabulary levels of the text were analysed in relation to the BNC-COCA list using Lextutor (lextutor.ca). This analysis indicated that 96.4% of the words in the text were at the 10,000-word level or below, and that 14.2% were off-list (mostly proper nouns and Latin species names, for which common names were also given). The 95% coverage mark occurred at the 7,000-word level and 98% coverage occurred at the 16,000-word level. As expected from an academic text, 10.2% of the words were found on Coxhead's (2000) Academic Word List. Participants were asked to report the extent to which they felt their understanding of the text was hindered by unfamiliar vocabulary on a 4-point scale.

2.1.2 Background data

Background data was collected on participants' language and education, any diagnosed reading difficulties, as well as extramural (English) reading habits. All participants reported on a 7-point scale (never – several hours a day) how often they read books, played massive multiplayer online games (MMOGs) or other types of electronic games,¹ and read online texts in English in their spare time. They also rated on a 5-point scale how quickly they felt that they read texts for university (very slowly – very quickly), and how easy they found it to understand the language of texts they read for university (very difficult – very easy). The Norwegian students were also asked to report their self-perceived reading speed in English (L2) relative to Norwegian (L1). Pilot testing with native speakers of Norwegian and English helped to clarify the wording of some questions.

The study originally aimed to compare reading speed between Norwegian students and a native English-speaking comparison group. Responses from the UK included a group of students with an L1 other than English, which was fortunate but unexpected, and therefore data unfortunately was not collected about their language background or length of residence in the UK.

2.2 Procedure and participants

The survey was completed by 367 university students in Norway and the UK, recruited from first- and second-year Psychology classes in order to control for educational background as far as possible. The participants fell into 3 groups based on their responses to the questions of where they were studying (UK or Norway) and their native language. Participants were asked to report their native language (defined as 'a language you have been hearing/speaking at home since you were a baby') and told they were allowed to select more than one. The Norwegian participants were recruited from three Norwegian universities, reported having L1 Norwegian, and did not report having L1 English. The other two groups were based in three universities in the UK; the English group reported having English as a native language and the Other group reported other L1s only. There were 16 different L1s reported in the Other group, the

¹ Although not all computer games require extensive reading, a strong relationship has been found between English proficiency and gaming in younger Norwegians (Brevik, 2016).

most common of which were Polish (4 participants), Cantonese (4 participants), and Bulgarian (3 participants).

Participants in Norway were informed about the study by the main researcher or their teacher during lectures and on their online learning platforms. UK participants in two of the institutions were recruited through a video by the main researcher and/or a message on their learning platform. Participants in the third UK university were recruited via a research participation scheme and received credits for research participation. Participation was voluntary and a chance to win travel vouchers was offered as incentive for participation.

Because the survey was anonymous and unsupervised, it is impossible to know whether participants read the text carefully before answering the comprehension questions. Therefore, participants who scored less than four out of eight on the comprehension questions were excluded, since this indicated that they had not read carefully or that their reading times did not reflect the amount of time they needed to understand the text. Furthermore, some participants' extremely high or low reading times skewed the data (range: 4 seconds to 3616 seconds) and clearly did not reflect realistic reading times. The median absolute deviation (MAD) was used to identify and exclude reading times that fell outside the median deviation of the median. MAD is less sensitive to influence from outliers than measures of deviation based on the mean, such as standard deviation (Leys, Ley, Klein, Bernard, & Licata, 2013). After excluding these data points, a total of 295 responses remained: 72 participants in the Norwegian group, 195 in the English group (179 English monolinguals and 16 bilinguals), and 28 UK-based students whose L1 was not English in the Other group. Table 1 shows the numbers of participants per group and per year of studies.

Table 1: Number of participants in each year of study by language background. $N=295$

	English L1	Norwegian L1	Other L1
1st year	88	40	11
2nd year	100	14	15
3rd year	3	9	2
4th year	3	7	0
4+ years	1	2	0
TOTAL	195	72	28

Participants were predominantly female (English: 85.7%, Norwegian: 73.6%, Other: 85.7%) with a mean age of 20 for the UK-based students and 22 for the Norwegian students.

To check of how well suited the text was to the construct under investigation (academic reading for university), participants were asked about their experience of reading the text compared to what they usually read for university on a 5-point scale (much harder – much easier). Approximately half of the participants in each group rated the survey text as being a similar level of difficulty to their university readings (Norwegian: 46%, English: 49%, Other: 50%). The Other group had the highest percentage of participants who rated the text as easier or much easier than their university readings (50%), compared to the Norwegian (39%) and English (38%) groups. On the whole, this indicates that the text would give a reasonable indication of university reading and that, if anything, students may find this text easier to read than their actual university readings.

2.3 Analysis

The time it took participants to read the pages of text functioned as the dependent variable throughout the analysis. Group means were compared using Analysis of Variance (ANOVA) and Mann-Whitney-Wilcoxon tests. Regression models were used to investigate whether the reported frequency of exposure to extramural English was a predictor of reading speed.

3. Results

The results are presented below, starting with the comprehension questions and participants' reported experience of reading the text, followed by a between-group comparison of reading speed. Finally, language exposure variables are investigated as potential predictors of reading speed.

3.1 Comprehension

The main purpose of the comprehension questions was to check that participants had attempted to read and understand the text, so they were designed to prevent guessing. Since comprehension was not the main focus, participants were only asked eight questions. Participants who answered fewer than four of the questions correctly were excluded since this suggested that they had not read the text as instructed. Table 2 shows the mean number of correct answers for each group.

Table 2: Mean comprehension score (out of 8) and standard deviation (in parentheses) for each language group

	English L1	Norwegian L1	Other L1
Comprehension score	6.56 (1.14)	6.71 (1.05)	6.61 (1.10)

As seen in Table 2, the groups had very similar comprehension scores, and not necessarily due to ceiling effects, with mean scores well below 7 out of a maximum of 8. A one-way between-subjects ANOVA confirmed that the comprehension scores were not significantly different between groups.

The vast majority (94%) reported that the information in the text was completely or mostly new to them, which suggests that none of the groups had an advantage in guessing the answers to the comprehension questions without reading the text. Participants reported how easy they found the text on a 5-point scale (very difficult–very easy). The majority of participants (62%) reported that the text was very easy or mostly easy to understand, 15% said it was difficult or very difficult and the rest (23%) were neutral. This varied between groups, with slightly fewer participants from the Norwegian group reporting finding the text easy or very easy to understand (56.2%), compared to the English (64.1%) and Other (64.3%) groups.

Two thirds (67%) reported not understanding parts of the text due to unfamiliar vocabulary. The proportions of participants reporting unfamiliar vocabulary as an obstacle to comprehension varied between groups, with the highest proportion in the Norwegian group (83%), compared to the English (62%) and Other (61%) groups.

3.2 RQ1: Reading speed

The main question in this study was how the reading speed for Norwegian students compared with that of the native English speakers and the non-native English-speakers living in the UK. Therefore, the mean time spent on each page was calculated for each group, as shown in Table 3.

Table 3: Mean number of seconds (and standard deviation) spent on each page of the reading text, as well as total reading time, for each group.

	English L1	Norwegian L1	Other L1
Page 1	170.86 (71.73)	224.35 (63.39)	172.32 (71.58)
Page 2	117.67 (56.16)	165.44 (41.19)	128.75 (64.36)
Page 3	94.41 (47.59)	133.68 (37.34)	103.39 (50.39)
Total	382.94 (158.95)	523.47 (129.94)	404.46 (166.90)

As Table 3 shows, the English group were the fastest readers, followed by the Other group, while the Norwegian group took the longest time to read the text. On average, the English group needed only 73.23% and the Other group 77.25% of the time that the Norwegians used. A density plot was created to show the distribution of reading times, shown in Figure 1.

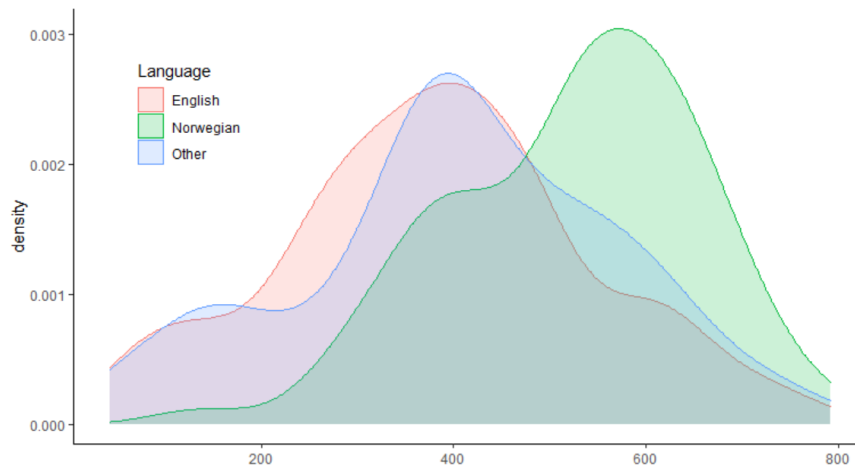


Figure 1: Density plot showing distribution of total reading time (in seconds) for the three language groups

As illustrated in Figure 1, there is a lot of overlap between groups. The two UK-based groups are almost entirely overlapping, although the Other group are at the slower end of the peak. There is, however, a clear distinction between the Norwegian group and the UK-based groups.

A one-way between-subjects ANOVA showed that mean reading times for the three language groups were significantly different [$F(2, 292) = 22.27, p < .001$]. Post hoc comparisons using the Tukey test showed a significant difference between the Norwegian and English groups ($p < .001$), and between the Norwegian and Other groups ($p = .002$), but not between the English and Other groups ($p = .766$).

For the purposes of comparison to previous studies, reading speed was calculated as the mean number of words per minute for each group, both for each page and in total (Table 4).

Table 4: Mean number of words per minute for each group

	English L1	Norwegian L1	Other L1
Page 1	194.90	148.42	193.25
Page 2	236.59	168.28	216.23
Page 3	251.67	177.74	229.81
Overall	221.71	162.19	209.91

As Table 4 shows, the English group read the highest number of words per minute for each page, and the Norwegian group consistently had the lowest number. In all groups, the number of words per minute increased for each subsequent page, presumably as a result of acclimatisation to the task. A meta-analysis of reading rate studies by Brysbaert (2019) demonstrated that average reading speed was 238 words per minute in English for adult native speakers. Overall, the average number of words per minute in the English group is close to this number. The Norwegian group, on the other hand, is clearly below this number for all three pages.

The slower L2 reading was also reflected in how Norwegian participants felt about their reading. Participants who reported having Norwegian as their L1 were asked how fast they felt that they read in English compared to Norwegian. Only 14% said that they felt they read equally fast in both languages and 82% said that they felt English reading was somewhat or very much slower than Norwegian.

3.2.1 Bilingual students in the English group

In the English group, 16 participants reported having a second L1 in addition to English. Since simply being bilingual may affect language processing and, consequently, reading speed, reading times for these 16 participants were compared with the 179 monolingual English speakers in this group. Because of the difference in sample size, the non-parametric Mann-Whitney-Wilcoxon test was used to determine whether these groups differed significantly. This test showed that reading speed scores between the two groups were not significantly different ($W = 1645.5, p = .325$).

3.3 RQ2: Effect of extramural English

In light of previous research recommending extensive reading as a method to improve reading speed, exposure to extramural English was investigated as a predictor of reading speed in the two L2 English groups. All participants were asked to report how often they read books, read online, played massively multiplayer online games (MMOGs), and played other electronic games in English on a 7-point scale (never–several hours a day). The responses from the two L2 groups, for whom such exposure might theoretically have an impact, can be seen in Table 5.

Table 5: The percentage of L2 participants who reported reading books, reading online, and playing MMOGs and other games in English in their spare time

	Reading books		Online reading		MMOGs		Gaming	
	Nor	Other	Nor	Other	Nor	Other	Nor	Other
Never	5.56	10.71	0.00	0.00	65.28	64.29	34.72	42.86
Occasionally	29.17	25.00	6.94	0.00	20.83	25.00	27.78	28.57
Monthly	22.22	3.57	4.17	0.00	5.56	0.00	13.89	3.57
Weekly	11.11	10.71	12.50	0.00	4.17	0.00	9.72	3.57
Several times a week	12.50	25.00	9.72	10.71	0.00	10.71	9.72	14.29
Daily	18.06	25.00	47.22	39.29	2.78	0.00	4.17	7.14
Several hours a day	1.39	0.00	19.44	50.00	1.39	0.00	0.00	0.00

As shown in Table 5, all L2 participants reported reading English online at least sometimes, and the majority also reported reading books and gaming in English, sometimes even for several hours a day. This demonstrates that all participants were reading in English in their spare time. It is interesting to note that the Norwegian students generally reported similar frequency of exposure to extramural English as L2 users in an English-speaking environment, although the Other group reported more English online reading.

Multiple regression models were calculated to investigate these types of extramural input as predictors of reading speed among the L2 users. No significant associations were found between these input variables and the time spent on the academic reading task in the Norwegian group ($F(4, 67) = 0.604$, $p = .661$) or the Other group ($F(4, 23) = 0.337$, $p = .850$).

Backward elimination of input variables also failed to produce a well-fitting model in either group, indicating that reported frequency of extramural English exposure was not a significant predictor of reading speed for the L2 users in this study.

4. Discussion

4.1 Reading speed

This study compared reading speed of academic text between undergraduate Psychology students with different language backgrounds who are all expected to read academic texts in English. We start by addressing our first research question about reading speed differences in the three groups. For students based in the UK, there was no significant difference in reading speed between L1 and L2 English users. However, the Norwegian L1 speakers in Norway spent significantly more time reading the text than both UK-based groups, and on average the native English-speaking students took only 73% of the time it took the Norwegians to read the text. This is very similar to the findings in Shaw and McMillion's (2011) study comparing Swedish and British undergraduate biology students, although the current study used a longer and more academic text to simulate university reading. The results indicate that the Norwegian students would need more time than students in the UK, even those with L2 English, to read the same volume of text, which does not appear to be simply a product of their L2 status.

One potential explanation for the slower reading among the Norwegian participants is simply that they have lower English proficiency than those based in an English-speaking country, especially since more challenging reading tasks (such as academic reading) require higher proficiency (Fraser, 2007). Reasons could be the greater opportunities for input, both academic and non-academic, in an immersion context, and also that the English proficiency requirements of UK universities mean only students with high proficiency had been admitted, while no such requirement exists for Norwegian students in Norway. This explanation in itself would be noteworthy given the generally high English proficiency in Norway compared to other countries where academic reading in English may also be required. This underlines the importance of investigating this specific context, and not basing our assumptions about L2 English reading

in Norwegian universities on either lower-proficiency readers in other countries, or on L2 readers in an immersion setting.

However, given the similarities in scores on the comprehension questions, and the fact that studies have found no correlation between reading speed and L2 proficiency among advanced L2 users (Cop et al., 2015; Fraser, 2007), it is likely that the explanation for the lower reading speed in the Norwegian group is more complex than simply differences in proficiency. As seen in the density plot (Figure 1), the slower average speed among Norwegian students is general, with the majority reading at slower speed than the majority of the L1 speakers, whereas the L2 speakers in the UK more generally perform within the range of the native speakers.

4.2 Extramural input

Our second research question asked about the role of extramural input. In contrast to previous studies of vocabulary in Norwegian university students (Busby, 2020), the present results showed that extramural English exposure was not a significant predictor of reading speed for the Norwegian participants. The role of academic language may be important here, with the types of extramural English examined being unlikely to be particularly academic. It is not surprising that there was no significant effect of extramural activities for the Other students given that they are immersed in an English speaking environment and would have many more opportunities for exposure to English than the activities investigated in this study, both inside and outside the university setting, although it was interesting to note that they reported engaging in these activities at a frequency that was similar to the Norwegian students.

While most participants in all groups reported that the text in this study was similar to or easier than texts they read for university, it is noteworthy that it contains vocabulary items from frequency levels which Busby (2020) found to be problematic for Norwegian university students. The speed of lexical access depends on both language proficiency and the number of times readers have encountered vocabulary items (Tanabe, 2016), so the presence of infrequent vocabulary can be expected to slow down reading. This could imply that the extramural input available to the Norwegian participants does not provide exposure to the relevant vocabulary, which in turn may lead to slower reading. There were no important differences in extramural input in the two groups of L2 English participants, but participants in the UK are likely to use English for more

academic tasks, i.e. listening to lectures, discussion in seminars, and their own writing, whereas the Norwegian participants are more likely to perform these tasks in Norwegian, which could account for the differences. Since the definition provided of native language in the background questionnaire was related to home language, we do not know how long the L2 users in the UK had lived there, or whether some may in fact have been born in the UK. Thus, it is also possible that some of these participants had used English academically for longer. Although English instruction in Norwegian schools starts already at age 6, exposure to authentic academic material in English is low prior to university.

However, taking research on sentence processing in L2 versus L1 into account, the slower reading times in the Norwegian group may not be an effect only of lower proficiency and lack of vocabulary. Important differences in L2 processing have been found between immersed and non-immersed speakers, even when proficiency was similar (Fraser, 2007; Pliatsikas & Marinis, 2013). This might imply that the extramural and university English input in a parallel language situation such as Norway, though relatively massive, is still not sufficient to make up for differences in processing, resulting in slower academic reading speed compared to L2 speakers living in the UK who, importantly, are likely to be using English for most academic activities, including lectures, discussions, and assignments. The faster English reading in the UK-based L2 group may also be a result of more efficient L1 inhibition due to the English-speaking environment (see e.g., Linck et al., 2009).

4.3 Implications of slow reading

If the slower reading in the Norwegian group is a result of their non-immersion context, whether in terms of proficiency or of processing speed, this may have implications for all students currently reading in English for university in non-English speaking communities. The fact that our Norwegian participants presumably use Norwegian for most aspects of their everyday life and, importantly, that their lectures are also predominantly in Norwegian and their use of English is mainly receptive, may mean that such lower reading speeds are an unavoidable effect of academic environments with such parallel language use, even with high L2 proficiency.

Regardless of the underlying causes of slower L2 reading, the fact remains that non-immersed L2 English users seemingly need more time to

read a given volume of text, which means they will need to dedicate more time and energy to reading for university. Pecorari et al. (2011) found that Swedish students reported needing to spend a lot more time when reading in L2, meaning that this was less rewarding, and some were unwilling or unable to invest the additional time. Fluent reading of extended texts is a skill that takes time to develop (Grabe, 2009), and the additional demands of L2 processing may also mean that long periods of reading are less sustainable for L2 readers. If it is the case that L2 reading is inherently slower than L1 reading in non-immersion settings, it leads to the question of whether it is reasonable to have the same expectations for such L2 readers as for native speakers, and what can be done to mitigate the effects of slower reading.

4.4 Validity and limitations

This study was designed to compare academic reading among students with closely matched educational backgrounds in different language situations. Therefore, only Psychology students were tested, and the results cannot necessarily be generalised to students in other study programs, although similar results have also been found in studies comparing Swedish and L1 English-speaking biology students (Shaw & McMillion, 2008, 2011). Given that this study focused on L2 reading and may therefore have seemed more relevant for the L2 users, it is possible that the English group were less motivated and therefore spent less time on reading. This group did have the highest exclusion rate for low comprehension scores (and very short reading times). However, the similar average comprehension scores indicate that the remaining participants did read the text. It should also be mentioned that we do not know how long the UK-based L2 users had been learning English or had been studying in an English-speaking environment. However, since it is unlikely that all participants in this group had in fact lived in the UK since childhood, their relatively uniform reading times are striking. Still, this issue would be an important focus for future research.

The goal was to investigate reading speed in a situation that simulated reading for university, but we cannot be absolutely certain that participants did read the text. However, only analysing data from participants with reasonable reading times and more than half of the comprehension questions correctly answered should give a reasonable indication of average reading speed in these groups. It should also be noted that there

were only eight non-validated comprehension questions designed to check that participants read the text. Therefore, we are unable to say with certainty how much participants understood or what they would remember on a delayed post-test. We also did not directly test L2 proficiency, which is less strongly associated with reading rate among advanced L2 users (Cop et al., 2015; Fraser, 2007); this would be interesting to include in future studies. Additionally, more questions about extramural English exposure would have been useful, especially since these questions were only self-reports about how often participants interact with English language materials in the present time, meaning that they are not a measure of cumulative exposure over time.

5. Conclusion

In the present study, we investigated reading times and comprehension in English in three groups of Psychology students, namely L1 Norwegian speakers studying in Norway, L1 English speakers in the UK, and L1 speakers of other languages studying in the UK. Results indicate that all three groups achieve similar comprehension scores, but that reading times for the Norwegians were significantly slower than for both native and non-native English speakers in the UK. Furthermore, no relationship was found between extramural input and reading speed in the Norwegian group. These results indicate that non-immersed L2 readers can be expected to read more slowly than both L1 and L2 readers in an English-speaking environment, although this may not impede comprehension. Importantly, it seems that it is the non-immersion context and possibly the parallel language use encountered by the Norwegian group which causes the difference compared to native speakers. In an academic world where such parallel language use is common, these findings have important implications for expectations for university reading. Our findings may have consequences for how school systems can better prepare students, for the support which universities need to provide, and for the time students must be prepared to spend on their studies. Further research is needed into academic L2 reading in parallel language environments since this study indicates that students in these environments have different needs and abilities from L2 readers in other contexts and need to be studied in their own right.

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