The Role of Extensive Reading in the Development of Phonological Processing

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Abstract: The present study aims to investigate the role of extensive reading in the acquisition of implicit phonological knowledge. Through extensive exposure to print, L2 learners can improve their phonological processing skills, and this could contribute to their word recognition fluency. On the basis of the Oxford Placement Test, 30 9th graders and 30 11th graders studying at a selective state high school in İstanbul were selected to participate in the study. Students in the 9th grade followed an extensive reading program for a full semester. Participants were given a lexical decision task in which they had to decide whether the string of words they were shown on a computer screen could be acceptable words in English or not. Pre- and post-test performances of the groups were compared to test if the extensive reading program contributed to their accumulation of knowledge on phonotactic constraints. The results showed that the group which read extensively differed significantly, and notwithstanding their lower proficiency, the groups' performance on the post-test did not reveal any significant difference, implying that extensive exposure to print benefited L2 learners even at the beginner levels. As this is a relatively new research perspective on extensive reading, there is need for further research.

Yaygın Okumanın Sesbilimsel İşlemenin Gelişimi Üzerine Etkisi
Öz: Bu çalışma, yaygın okumanın sesbilimsel bilginin örtülü edinimini incelemeyi amaçlamaktadır. İkinci dil öğrenenler, yaygın okuma sayesinde sesbilimsel işleme becerilerini geliştirebilirler ve bu da sözcük tanıma akıcılığına katkı sağlayabilir. Çalışma için, İstanbul'da seçkin bir devlet okulunda 9 ve 11. sınıflarda okuyan 30'ar öğrenci Oxford Seviye Tespit Sınavı sonuçlarına göre seçilmiştir. 9. sınıf öğrencileri bir yarıyıl boyunca yaygın okuma programı takip etmişlerdir. Katılımcılara, bilgisayar ekranında gördükleri harf dizgilerinin İngilizcede geçerli bir kelime olup olmadığına karar vermeleri gereken sözcüksel karar testi uygulanmıştır. Yaygın okuma programının sesbirim dizge bilgisi kurallarının kazanılmasına katkı sağlayıp sağlamadığını test etmek için araştırma gruplarının ön test ve son test performansları karşılaştırılmıştır. Sonuçlar, yaygın okuma grubundaki öğrencilerin ön test ve son test skorları arasında anlamlı bir fark olduğunu ve dil seviyeleri henüz yetersiz olmasına rağmen, yaygın okuma grubunda olmayan öğrencilerle son test skorları açısından anlamlı bir farklılık göstermediklerini ortaya koymuştur. Bu bulgular, yaygın okumanın başlangıç seviyesindeki ikinci dil öğrenenler için bile fayda sağlayacağına işaret etmektedir. Görece yeni bir araştırma perspektifi olduğundan dolayı, konuyla ilgili daha fazla bilimsel çalışmaya ihtiyaç duyulmaktadır.

1. Introduction

Reading is undoubtedly a complex construct. Therefore, there is a considerable body of research on the development of this intricate process. Comprehending a text in a language other than one's mother tongue makes the process even more effortful because of the many linguistic difficulties. Although reading in the first language (L1) has been widely studied, second language (L2) reading has remained relatively unexplored. Initially, findings from L1 reading development set the tone for principles governing reading in L2 as it was claimed that, cognitively speaking, reading is a universal process (Grabe & Stoller, 2011). As a result, many useful instructional techniques used in L1 reading were adapted for the purposes of developing L2 reading skills. One of such approaches to reading is Extensive Reading (ER), which was consistently found to be effective in developing efficient reading skills in L1.

The rationale behind the approach is a belief that extensive exposure to language input will help develop many aspects of language, all of which contribute to the development of reading comprehension skills. With the remarkable increase in interest and decades of research (Iwahori, 2008; Mason & Krashen, 1997; Renandya, 2007; Ro, 2016; Robb & Kano, 2013), it has now been well-established that ER has a positive impact on cognitive and affective domains of reading in L2 (Yamashita, 2015). Among the many areas that extensive reading has been consistently found beneficial for L2 learners are reading comprehension skills (Bell, 2001; Day & Bamford, 2007; Stanovich, 2000; Tanaka & Stapleton, 2007), vocabulary growth (Horst, 2005; Nation, 2015; Pigada & Schmitt, 2006), reading attitudes and motivation (Lake, 2014; Takase, 2007; Yamashita, 2013), reading rate and fluency (Beglar & Hunt, 2014; Iwahori, 2008; Perfetti, 2007), writing skills (Hafiz & Tudor, 1997; Olivier & Simasiku, 2015), and gains in conceptual and world knowledge (Grabe & Stoller, 2011; Guthrie, et al., 1998).

There is another related area which still remains untouched. Possible contributions of extensive reading to learners' processing of the L2 phonology has yet to be researched. Although there is a considerable body of research suggesting a strong link between one's knowledge of the sound system of the language and reading skills in first language acquisition (Gillon, 2007; Verhoeven, 2007), this relationship has not been explored by L2 reading researchers. It is the knowledge of the phonological rules, that is, the phonotactic constraints that foster word recognition skills. Therefore, there is need to probe into the question of whether beginner EFL learners can develop phonological representation through the knowledge of phonotactic rules they collect via reading extensively. Namely, the present study aims to compare the effects of extensive reading and proficiency level on the development of phonological representation as a contributor of automatic word recognition. Put differently, in a lexical decision task where students must decide whether a given combination of letters is acceptable in English or not, can beginner ESL learners, who have to resort to implicit knowledge of phonotactic constraints they have gained through extensive reading, perform better than intermediate students, who have not been instructed with an extensive reading program.

1.2. Background and Rationale to the Study

This study is significant in several respects. Firstly, it is, to my present knowledge, a unique attempt to investigate the ER in terms of its effects on developing L2 readers' phonological awareness skills. The results might offer insights into the cognitive benefits of ER, and thus provide novel perspectives for further research. Secondly, most ER research is intervention studies which apply ER as a research tool. Participants in the ER intervention groups do actually continue receiving L2 input outside the ER program, which could contaminate the data (Yamashita, 2008). This study, however, was carried out at a high school which recently

started to apply an input-based language teaching approach. Students do not receive any explicit instruction, but only have sustained silent reading (SSR) classes where they read graded books of their selection. Finally, ER studies with high school students are rare (Iwahori, 2008).

The study is grounded on two basic constructs. As the purpose is to explore the possibility that extensive reading could contribute to improved word recognition abilities by developing phonological processing skills, it is necessary to briefly touch upon the constructs of extensive reading and phonological processing.

According to Krashen (1993), ER appears under several names in the literature such as pleasure reading and free voluntary reading (FVR). Some other names referring to such similar applications are Hunt's (1970) uninterrupted sustained silent reading (Hunt, 1970) and independent reading, book flood (an idea originally developed and used by The University of South Pacific in 1970s, as reported in Elley, 2000), and drop everything and read (DEAR). Each name, by itself, indicates different aspects of ER, which implies the multiplicity of its meanings (Yamashita, 2015). Despite the lack of an all-agreed-upon definition of the term, as the various names suggest, some of the components have unanimously been emphasized: It is a free and voluntary reading practice which is primarily based on learner reading pleasure over an extended period of time.

The purpose of this paper is not to bring together varying definitions of ER as "there is already a considerable variability in the conceptualization of extensive reading itself" (Waring & McLean, 2015, p. 160). However, since the study claims to be probing into its effects, it is necessary to explain how it is conceived. Rather than adopting a single definition, this paper makes use of Waring and McLean's (2015) perception of core and variable components of ER. Reviewing a myriad of definitions, the authors outlined the most frequently repeated elements as core components, and others as variable components of ER. The widespread appearance of the four elements below make up the core components (Waring & McLean, 2015, p. 162):

Fluent comprehension
High reading speed
Reading large amounts of text
Focus on the meaning of text

The ER program applied at the school where the study was carried out encompasses these core elements. Applied under the name of SSR, students in the program are encouraged to choose books of their interest from a library rich in graded books and read at their own pace during the 3-hour SSR classes every week. There is no language-focused activities during SSR classes or afterwards as the emphasis is on meaning and fluency. Teachers are present to assist students when they encounter a structural or lexical difficulty so that their reading speed is not curbed.

1.3. Phonological Processing and Self-Teaching Hypothesis

Phonological processing, sometimes used interchangeably with phonological awareness, is defined broadly as "the use of phonological information in processing spoken and written language" (Gillon, 2007, p. 9), and it has been found to be one of the strongest predictors of early reading development of children learning their mother tongue (Ehri, et al., 2001). Moreover, such research found that the predictive power of phonological processing wanes after the second grade (Ehri, et al., 2001; Hogan, Catts, & Little, 2005) which led scholars to further delve into the issue with a view to setting the role it plays in reading ability. They

concluded that there exists a mutual relationship between children's phonological awareness and reading skill (McGuinness, McGuinness, & Donohue, 1995). At first, phonological awareness contributes to reading, yet "once reading is underway, the process of learning to read influences phonological awareness".

The reciprocity between reading and phonological processing could indicate that although children initially rely on phonological knowledge they obtain from the words they hear, that is, they use the phonological route, they start to use the sound structure of the printed words, namely, the visual route, in decoding words as they become literate (Ehri, et al., 2001). Therefore, through extensive exposure to print, they must be able to reach the level of automatization in word recognition skills, which makes them fluent readers and comprehenders.

Phonological processing skills form the backbone of children's ability to decode words in print. Frequent encounters with words foster children's phoneme-grapheme representations (Li, 2010). Through multiple experiences children are able to access automatic word recognition, which is the basic rationale behind phonological knowledge being a very strong predictor of early reading ability. This process is termed in the literature as the "self-teaching hypothesis" (Share, 1999). The hypothesis postulates that "the ability to decode words using knowledge of grapheme-phoneme relationships is the primary component involved in the development of fluent word reading" (Gillon, 2007, p. 29). This explains how children develop an implicit knowledge of the sound system of their environmental language because "within the self-teaching model, the development of the ability to recognize words by sight (as opposed to decoding each word letter by letter) may be viewed as the product of accumulated phonological and orthographic word knowledge developed in response to successful decoding attempts" (Gillon, 2007, p. 29).

What makes children gain an early access to words is the knowledge of phonology they acquire implicitly. This is achieved by means of what is referred to in literature as phonological representation (Swan & Goswami, 1997), which is considered influential in the phonological structure of the words children are exposed to. Phonological representation, as part of phonological awareness knowledge, is defined as "the mental representation of the sounds and combinations of sounds that comprise words in a particular spoken language" (Goswami, 2012, p. 2625), and it "may be particularly important in applying grapheme-phoneme knowledge" (Gillon, 2007, p. 54).

As a result, the knowledge of phonology is a significant factor in reading development since "all learners need to develop phonological awareness abilities for word recognition" (Grabe, 2009, p. 118). Through a self-teaching model, L2 readers can also improve their phonological processing skills as multiple encounters with language input would enable them to process more grapheme-morpheme correspondences. They can thus enhance their word recognition skills, lack of which poses a stumbling block to L2 reading fluency. With its possible contribution to L2 readers' word decoding skills, ER can have far-reaching effects on removing this barrier. Reading extensively can entertain L2 learners, who will then be more enthusiastic to read further, and as they read more, they will be more fluent readers. Phonological processing, the core component of the self-teaching model, can hence boost this "virtuous circle of the good reader" (Nuttall, 2005, p. 127).

1.4. Research Question
With a view to exploring the possible contributions of ER on L2 readers' phonological processing as represented by implicit learning of phonotactic constraints through extensive exposure to print, the study seeks an answer to following question: is it higher proficiency or

more exposure to print (ER) that makes L2 readers more able in processing the L2 phonology?

It is predicted that extensive exposure to print will accelerate the acquisition of phonological knowledge in beginner L2 readers, so despite nearly three years of explicit formal instruction, students in the higher proficiency group will not differ significantly to the lower proficiency group in terms of phonological processing as measured by an online lexical decision task.

1.5. Limitations and Delimitations

It is generally accentuated that ER reveals its benefits after an extended period of time (Grabe & Stoller, 2011). Although the SSR program will continue for four years, until the students graduate from the school, the data for this study was collected within only the first semester of school (approximately 4 months). However, as phonological awareness is the earliest acquired component of metalinguistic knowledge, benefits as early as 4 months could be expected.

Although students' reading is tracked with reading logs, the number of pages reported is based on a verbal protocol done at the beginning of the semester. Teachers of SSR classes note down whatever pages students report to have read. Therefore, there is not any outside control or a secondary check mechanism. Besides, the quality of participants' reading is not known well. Students were randomly given oral interviews in their L1 to check comprehension, as they were not proficient enough to talk about books in L2. Finally, students in the ER program read books at Quick, Starter Stage 1 and Stage 2 levels. The page layout in these books varies, some having more pictures and some less. Therefore, tracking based on page numbers may not be a very reliable measure. Students who read 1200 pages might have encountered more words than students who read 1400 pages.

2. Method
2.1. Participants

The study was carried out at a state owned all-male boarding high school in İstanbul. A total of 60 students with right hand dominance partook in the study. On the basis of the Oxford Placement Test (OPT) scores, 30 students out of 143 9th graders and 30 out of 230 11th graders were selected. While the 9th graders, aged 14-15 with an OPT score ranging from 12 to 19 (A1), made up the treatment group, 11th graders, aged 16-17 with OPT scores ranging from 48 to 57 (B1), were placed in the comparison group. At the beginning of the 2015-2016 academic year, the school started a comprehension-based language teaching approach, so students in the 9th grade do not receive any explicit language instruction. Their 10-hour weekly program is divided into 3 hours of SSR, 2 hours of listening/video classes, 1 hour of conversation with a native speaker, and 4 hours of main course, all of which are designed to provide comprehensible input.

The school has a large library replete with graded books for all levels. During the 3 hours of SSR in the first week of school, the 9th graders were familiarized with the library and the new teaching approach. During the SSR classes, students read graded books of their selection at their own pace. They were instructed that the approach is based on pleasure reading of materials at their own language proficiency. Therefore, they were advised to quit reading any books that did not appeal to their interest, or that were above their grasp. They were also encouraged to read outside class time.

Participants in the 11th grade started school in the prep class, which was removed from the introduction of the comprehension-based language teaching approach. Therefore, until the end of the first semester of the 2015-2016 academic year, when the data collection for this study was finalized, they had 25 hours of English in the prep class, 10 hours in Grade 10, and 10

hours in Grade 11. In total, they received approximately 1800 hours of language instruction, mostly in the traditional way whereby they explicitly studied such distinct language elements as grammar and lexis as compared to comprehension-based instruction of one semester (nearly 180 hours) in the Grade 9. Although the 9th graders read books during and outside the SSR classes, the only reading the students in the 11th grade did was the passages in their course books which were studied intensively with a focus of course on vocabulary and language structures rather than meaning and pleasure.

2.2. Instrumentation

The proficiency levels of students were identified through OPT, an online adaptive test of English measuring grammar, vocabulary, reading and listening skills. OPT automatically assigns each test taker to their levels according to CEFR descriptors. As it is a computer-adaptive test, the number of items offered to each student changes depending on their answers.

An online lexical decision task was developed to test the participants' implicit knowledge of phonotactic constraints indicating their phonological processing skills. It is well-established now in the literature that children rely on the implicit knowledge of the phonology of their environmental language to master the grapheme-phoneme correspondences, and thus become fluent in word recognition (Gillon, 2007; Hogan, Catts, & Little, 2005; Verhoeven, 2007). This implicit knowledge makes children able to judge whether a given string of letters is part of their mother tongue or not, so they can identify words, or possible words, from non-words (Gillon, 2007). Performance on online tasks is known to indicate implicit knowledge as they give participants no time to resort to their cognitive resources and stored knowledge (Norris, 2009).

The lexical decision task was composed of 75 items, which were presented with the E-Prime software version 2.0. The task included 25 non-words which had clusters that did not exist in English, 25 legal pseudo-words, and 25 real words which served as fillers. The length of all the words was between 4 and 7 letters. Items for the lexical decision task were downloaded from ARC Non-word Database, an open online tool developed by the Department of Cognitive Science at Macquarie University[1]. As a user-friendly tool with many specifications ranging from number of letters to neighborhood size, it allows researchers to choose the properties of the word list they want to use. Special caution was exerted while selecting items to not include phonological neighbors. For instance, [sb] is not a permissible cluster in the initial position, so *sbeak* would be a possible non-word, but it was not used as its explicit proximity to *speak*, a real word, because it could shadow the participants' real performance on the task.

2.3. Procedures

After the students took the OPT, the 30 students from Grade 9 with the lowest scores, and the 30 from Grade 11 with the highest scores were identified and placed into treatment and comparison groups respectively. Students in the treatment group were introduced to the library, the graded books and the tenets of the comprehension-based language teaching approach. Their reading was tracked through weekly reading logs, and the number of pages they read was then transferred into Microsoft Excel to calculate the sums of the pages they read.

The participants were given the lexical decision task on the E-Prime software before and after the experiment. They first saw a series of hashes (#####) followed by string of letters each of

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[1] http://www.cogsci.mq.edu.au/research/resources/nwdb/nwdb.html

which stayed on the screen for 500 milliseconds. They were instructed to press the Y button if they thought the combination of letters they saw was a real word or a possible word in English (pseudo-word), and the N button if it was not a word (non-word). Before taking the actual test, each participant did a trial version of the task composed of 10 items.

2.4. Data Analysis

OPT data was used to prove that the groups differed in their proficiency levels. This data was significant enough to suggest that any differences in the participants' lexical decision task performances were directly attributed to extensive reading, not their language proficiency levels. The data from the lexical decision task was first cleaned before it was transferred into SPSS version 20 for analysis. Since the set of real words was used as fillers, answers to them were eliminated. The remaining data was typed onto SPSS with each correct answer representing 1 point, so the maximum possible score was 50. Then independent samples t-tests were run to test whether the groups differed significantly in their lexical decision task performances on the pre- and post-tests.

3. Results

The OPT scores showed that the proficiency levels of the groups, the A1 treatment group (Beginner) and the B1 comparison group (intermediate), differed considerably. Therefore, their performance on the lexical decision task is largely dependent on the exposure to print. The SSR statistics of the 30 9th graders range between 1017 and 1821 pages, amounting to 45109 pages during the 16-week SSR program. Each student read an average of approximately 94 pages (min. 63.56 and max. 113.81 pages) each week.

Answering the research question of whether the SSR group and the non-SSR group differed in their lexical decision task performances requires an independent t-test. The data come from two independent groups, and the observed t value indicates whether the performance of these two groups are similar enough to conclude that they are likely from the same population (Jackson, 2009). The prediction was that there would be significant differences between pre- and post-test performances of the SSR group whereas no significance was expected in the non-SSR group and between the post-test performances of the two groups. Statistics for the results of the pre- and post-test performances of the both groups are shown in Table 1.

Table 1
Group statistics for pre- and post-test performances

		N	Mean	Std. Deviation	Std. Error Mean
Pre-test	SSR	30	22.77	6.882	1.256
	Non-SSR	30	5.503	1.005	
Post-test	SSR	30	32.70	4.120	.752
	Non-SSR	30	33.63	4.351	.794

Table 2 below shows the results of the t-test for the pre- and post-test performances of the SSR group. The mean difference of 10.067 is statistically significant at the alpha level of .05. Therefore, the SSR group performances on the lexical decision task before and after the experiment differed significantly. However, there was no significance between the pre- and post-test performances of the non-SSR group (.397>.05).

Table 2
Independent Samples Test

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Pre-test	-6.258	58	.000	-10.067	1.609
Post-test	-.853	58	.397	-.933	1.094

A further comparison was run to test if the post-test performance of the SSR group participants, who were exposed to language for only 16 weeks through an extensive reading program, approached that of the non-SSR group participants, who had been studying English for more than 3 years, which also included a prep class.

Table 3
Independent Samples Test

		t-test for Equality of Means				
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
LDT Scores (post-test)	Equal variances assumed	-.853	58	.397	-.933	1.094
	Equal variances not assumed	-.853	57.921	.397	-.933	1.094

The observed t value of -.853 is not statistically significant. The probability of this difference occurring by chance is above the level of significance (.397>.05). Therefore, students exposed to an extensive reading program were able to acquire an implicit phonological knowledge as early as 16 weeks into their language education.

4. Discussion and Conclusions

As the findings have shown, extensive exposure to print brought about a significant change in the participants' implicit phonological knowledge. The results, therefore, support the self-teaching model. Students could not perform well on the pre-test, which was administered two weeks after they started school, as they were not familiar with the sound system of the target language. Once they started the SSR program, which assured frequent and multiple encounters with words in print, they must have started "the self-teaching process by learning simple one-to-one phoneme-grapheme correspondences" (Gillon, 2007, p. 29). The incremental growth in the number of words they decoded in the course of the SSR program enabled them to "learn more complex relationships between phonemes and graphemes as they occur among other orthographic and morphemic constraints" (Gillon, 2007, p. 29). The findings are also in line with the modified version of the dual-route model of word decoding in that sight word reading develops through the implicit knowledge of phonology obtained as a result of extensive exposure to print (Ehri, et al., 2001).

The study could explain Nuttal's (2005) description of the good reader. Students who read a lot improve their word reading fluency which reflects in their passage reading fluency. Fluent reading means larger amounts of L2 input and increased reading fluency. This saves students more time and energy, and enriches their language background knowledge, encouraging them to read even more. If L2 readers cannot achieve this fluency, they will read less and receive less print exposure. One of the crucial components of this circle, then, is fluent word decoding, which, as the present study revealed, depends on implicit knowledge of the L2 phonology.

This is an early attempt to cast light onto how extensive exposure to print might improve L2 learners' phonological processing skills, which could, in turn, increase their word reading fluency. Although extensive reading benefits have been explored from many perspectives, the extensive reading-phonological knowledge interface has been left untouched. Therefore, the need for further research is clear and urgent before any strong claims in this vein can be made. However, it is obvious that extensive reading programs can benefit L2 learners, so teachers and school administrators should use extensive reading either as part of their instructional methodology or as a separate language teaching approach. As a result, "fluent and accurate word recognition has a role to play in developing reading abilities" (Grabe, 2009, p. 301), and ER can be a promising instructional device to foster word reading fluency.

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