

Cross-Linguistic Skills Transfer from the Second/Foreign Language to the First among Students with Learning Disabilities after an Intervention Program in the Second Language

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Abstract

Cross-linguistic skills transfer from the first language (L1) to the second/foreign language (L2) has been widely investigated and the impact of L1 on L2 learning has been documented. On the other hand, there are few studies that have investigated the reverse transfer of skills that are from L2 to L1. These studies support the CRT hypothesis which claims that such a transfer exists and that when an intervention program for the improvement of specific linguistic skills in L2 is applied in children with learning disabilities there is an improvement of the same skills in their L1, except for spelling skills (Abu-Rabia & Bluestein-Danon, 2012; Abu-Rabia, Shakkour, & Siegel, 2013). In the present study, a linguistic skill transfer from L2 (English) to L1 (Greek) is investigated, after an intervention in the L2, among secondary school students with learning disabilities (LD). The students (mean age 13.6 years old) were divided into an experimental group which received an intervention in L2's decoding and spelling skills and also into a control group which did not receive any intervention. Both groups were tested in their decoding reading skills and spelling in both languages. Our results showed that there was a transfer from L2 to L1 for decoding skills in the intervention group but not for spelling. These findings are in line with the CRT Hypothesis giving support to a linguistic skill transfer from L2 to L1, except for orthographic knowledge which seems to be language specific.

Keywords

Cross-Linguistic Skills Transfer, Decoding, Spelling, L1, L2, Learning Disabilities

1. Introduction

1.1. The Relationship between L1 and L2 Learning

It is generally accepted that students with reading difficulties and general learning disabilities face problems when they learn a foreign language (Abu-Rabia & Bluestein-Danon, 2012; Cummins, 1991; Geva, Yaghoub-Zadeh, & Schuster, 2000). Previous research has shown that there are relationship and interdependence between first and second/foreign language learning and that skills acquired in L1 play an important role in learning a second language (Sparks, 2012). More specifically, students with poor reading skills in L1 will also have poor skills in L2, because metalinguistic skills (such as phonological awareness, spelling knowledge, syntactic awareness, etc.) are common in all languages (Geva, 1995, as reported in Abu-Rabia & Bluestein-Danon, 2012; Housen & Simoens, 2016). Moreover, various studies in international literature support the link between L1 and L2 (Abu-Rabia & Siegel, 2002; Geva, 2000; Kahn-Horwitz, Shimron, & Sparks, 2005; Sun-Alperin & Wang, 2011; Sparks, 2012; Zhang & Koda, 2008) and there are also theories that support a linguistic skill transfer even between languages which differ in the degrees of transparency and have different characteristics (e.g. the Linguistic Interdependence Hypothesis and Threshold Hypothesis (Cummins, 1979, 1981), the Linguistic Coding Differences Hypothesis-LCDH (Sparks & Ganschow, 1995), the Central Processing Hypothesis (Geva & Siegel, 2000), the Script Dependent Hypothesis (Lieberman, Shankweiler, Fischer, & Carter, 1974; Lindgren, DeRenzi, & Richman, 1985, in Abu-Rabia et al., 2013).

1.2. Research Findings on the Linguistic Skills Transfer between Languages

Cummins (1979, 1981) presented the Theory of Language Interdependence which argues that the knowledge of a certain L1 can be positively transferred to a second language learnt. Since then, there has been a significant number of studies in international literature that corroborate the transfer of linguistic skills between different languages, for instance from Arabic to English (Abu-Rabia & Siegel, 2002; Al-Tamimi & Rabab'Ah, 2007), from Hebrew to English (Geva & Siegel, 2000), from English to French (Deacon, Wade-Woolley, & Kirby, 2009), from Russian to English (Abu-Rabia & Sanitsky, 2010), from Spanish to English (Ramirez, Chen, Geva, & Kiefer, 2010), from Persian to English (Nassaji & Geva, 1999), from Chinese to English (Wang, Koda, & Perfetti, 2003). Those studies have proven that skills such as vocabulary and syntactic awareness as well as phonological skills can be transferred from one language to another.

Several studies have shown that language components of L1, such as phonological and spelling knowledge contribute to the acquisition of L2 (Abu-Rabia & Bluestein-Danon, 2012; Abu-Rabia & Shakkour, 2014; Abu-Rabia et al., 2013; Durgunoglu, 2002; Kahn-Horwitz et al., 2005; Kieffer & Lesaux, 2008; Zhang & Koda, 2008; Talebi, 2014). According to the Linguistic Coding Differences Hy-

pothesis (Sparks & Ganschow, 1995), the existence of difficulties in L1 is a predictor for difficulties in the L2. As Sparks, Patton, Ganschow, & Humbach (2009) report, when students fail to reach a high level of competency in L2, limited skills in L1 are also entailed.

Furthermore, Kahn-Horwitz, Shimron & Sparks (2005) studied the cross-linguistic transfer of spelling skills and found that the knowledge of spelling in L1 helps the recognition of letters and their sounds, as well as the promotion of reading comprehension in L2. In addition, Deacon, Wade-Woolley & Kirby, (2009), Sun-Alperin & Wang, (2011) and Abu-Rabia & Sanitsky (2010), also supported the Cummins Theory of language interdependence (1979, 1981). However, researchers like Abu-Rabia, (2001) and Abu-Rabia & Siegel, (2003) support the script-dependent hypothesis, which claims that reading performance in a foreign language is related to the spelling of L1 and that spelling differences play a crucial role in L2 reading, which was also documented by other studies (e.g. Andreou & Segklia, 2017), and state that when the spelling of the two languages is different in depth, spelling knowledge cannot be transferred.

1.3. Cognitive-Retroactive Transfer Hypothesis (CRT)

While the transfer of linguistic skills from L1 to L2 has been studied extensively, only three studies have investigated the opposite. In particular, Abu-Rabia & Bluestein-Danon, (2012) studied whether improvement in L2 (English) would also improve students' L1 (Hebrew) with poor reading skills, thus developing the Cognitive-Retroactive Transfer Hypothesis (CRT) which is an expansion of the linguistic interdependence hypothesis by Cummins (1979, 1981), involving additionally the direction of the linguistic skills transfer from L2 to L1. The intervention that was conducted in L2 focused on factors such as phonological and morphological awareness, word recognition, reading ability and comprehension, syntactic awareness and spelling. After the intervention, there was an improvement in both L2 and L1 confirming the initial hypothesis. Similarly, Abu-Rabia et al., (2013) found a linguistic skills transfer from L2 (English) to L1 (Arabic) among bilingual students with learning disabilities (LD), thus validating the CRT Hypothesis. The intervention was conducted only in the L2 of the experimental group but it did not only improve L2 writing and reading skills but also those of L1 except for the Arabic spelling. In addition, Abu-Rabia & Shakkour (2014), studied whether improving linguistic skills of bilingual students with poor reading skills in the second foreign language can improve both the first foreign language and the mother tongue. The results of the research showed improvement in all the skills examined in all three languages, except for spelling knowledge in both the first foreign language and the mother tongue, thus concluding that orthography is language specific.

1.4. English vs Greek Orthography

English language is written from left to write using the Latin alphabet. It is a

language characterized as orthographically “deep” (Abu-Rabia & Bluestein-Danon, 2012; Abu-Rabia & Siegel, 2003; Andreou & Segklia, 2017) that includes a less direct correspondence between letters and sounds. In English orthography, the vowels are represented by means of letters and appear within the words themselves, so words are written the same for both beginners and more skilled readers. Baring this in mind, it is obvious that English readers rely more on the orthography and less on the phonological processing of words while reading (Abu-Rabia & Bluestein-Danon, 2012; Pae, Kim, Mano, & Kwon, 2017). In the English language each letter may correspond to different phonemes, depending on the letters surrounding it and each phoneme can be written in different ways depending on the word it appears in. The result of low transparency is that many words are more difficult to be read or written properly if someone does not know them (Protopapas, 2010).

On the other hand, Greek does not use the Latin alphabet. It is also written from left to right and it uses the Greek alphabet in which written symbols fully represent the phonemes. The Greek orthographic system is characterized as quite “transparent” in reading, but its spelled writing is phonologically translucent (Protopapas, Fakou, Drakopoulou, Skaloumbakas, & Mouzaki, 2013). Greek language has 24 letters representing 25 phonemes (32 allophones-5 vowels & 25 consonants). The terms “consonant” and “vowel” always refer to phonemes and never to letters.

In deep orthographic systems it seems that a student reads relying on morphological information and also reading in these orthographies can cause difficulties to students due to the inconsistency between graphemes and phonemes (Ziegler & Goswami, 2005). On the contrary, in languages with shallow orthography it is more likely to rely on phonological information while reading (Andreou & Baseki, 2012; Baseki, Andreou, & Tzivinikou, 2016).

1.5. Decoding

The term reading decoding refers to the process of identifying and manipulating the alphabetical code. According to Perfetti (1985) decoding is the ability to transform printed letter strings into a phonetic code. It requires knowledge of the spelling system of a specific language, phonemic awareness and phonological awareness skills as it is based on the graphophonemic correspondence (Porpodas, 2002). Decoding can be either loud, in which it is possible to check its quality, or silent, in which control can only be made through the comprehension of the text. It also describes the ability someone has to recognize words and pseudowords in isolation (Floyd, Keith, Taud, & McGrew, 2007; Laurent & Martinot, 2010; van Steensel, Oostdam, van Gelderen, & van Schooten, 2016). Decoding can be measured by testing how accurately and correctly we pronounce words of increased difficulty or pseudowords (Aarnoutse, Van Leeuwe, Voeten, & Oud, 2001). The role of decoding in reading comprehension has been proven by various empirical studies. Van der Schoot et al. (2008) found a positive correlation

between decoding and reading comprehension in pupils aged 10 - 12 years. As Snow (2002) reports, it has also been proven by research done over the past two decades that accurate and easy (automatic) word recognition is related to adequate reading comprehension.

According to research data from the Greek language (Padeliadu & Antoniou, 2013), a highly transparent language, conducted in the last grades of elementary school (fourth to sixth grade) and in high school (first and second grade), proved that reading fluency possesses a central role in reading, as decoding skills have been acquired by that age. However, this is not the case with English which is an orthographically deep language (Abu-Rabia & Bluestein-Danon, 2012; Chiang & Rvachew, 2007).

1.6. Orthographic Knowledge

Orthographic knowledge refers to the information we have memorized and helps us represent oral language in written form. It also consists of the orthographic symbols that are used in the written discourse that lead to its comprehension (Abu-Rabia & Shakkour, 2014). Furthermore, orthographic knowledge could be defined as the familiarity with the spelling rules of a language and the ability to identify the letter combinations that are permitted from those which are not (Sabet & Ostad, 2016).

There are two main kinds of orthographic knowledge: general orthographic knowledge and word-specific orthographic knowledge. General orthographic knowledge is related to the general knowledge of the spelling rules of a language and covers the whole writing system. Having this knowledge means that it is easy to distinguish permitted sub-lexical clusters from non-permitted ones. On the other hand, word-specific orthographic knowledge refers to the knowledge of the letter sequence within a single word which is assisted by memory (Hagi-liassis et al., 2006; Sabet & Ostad, 2016).

In order to acquire L2 orthographic skills, learners need to know and follow the orthographic rules of this language. More specifically, they must know written symbols, recognize permissible patterns, understand the linguistic rules of the target language and also conquer the correspondence of symbols and their sounds (Abu-Rabia & Shakkour, 2014; Akamatsu, 1999; Shiotsu, 2009; Sparks, Patton, Ganschow, Humbach, & Javorsky, 2008). Furthermore, the development of reading skills in L2 is based on the orthographic skills of L1 and also the orthography of a specific language.

In view of the above and because of the fact that very few research has been conducted on the cross linguistic skills transfer from L2 to L1, and none concerning the Greek language as an L1, the aim of the present study is to examine further the transfer of decoding and spelling skills from English as an L2 to Greek as an L1 after an intervention program in L2, in students with learning disabilities and discuss them in terms of the CRT hypothesis. More specifically, our research questions are:

- 1) Will there be an improvement in L2 decoding after the intervention in L2?
- 2) Will there be an improvement in L1 decoding after the intervention in L2?
- 3) Will there be an improvement in L2 spelling after the intervention in L2?
- 4) Will there be an improvement in L1 spelling after the intervention in L2?

2. Method

2.1. Participants

35 Greek 8th grade students with Greek as a first language (L1) and English as a foreign language (L2) were the participants of the study. They all came from a middle socio-economic level, studying in an ordinary high school. These students were defined by their teachers as “weak learners” in both Greek and English and they had all received a diagnosis for learning disabilities from a public Center of Differential Diagnosis, Diagnosis and Support of Special Educational Needs (KEDDY). They had all attended English classes since the 3rd grade and they did not take any extra lessons in English except for those at school. Their level in English was assessed with the Oxford online placement test and they were all at the same level (beginners). The students were selected at random from two different schools in Volos, Greece. The sample was divided into the experimental group, which included 9 boys and 11 girls and the control group, which consisted of 7 girls and 8 boys with a combined average of 13.6 years of age.

2.2. Procedure

Two weeks before the intervention both groups were tested (pre-test) in decoding and spelling in both languages. The same tests were administered two weeks after the intervention (post-tests) to all the students as well. The results of the pre-tests were used for establishing a base line for comparison with the results obtained at the end of the intervention program. The tests were administered individually in a quiet room. All instructions were given in Greek (L1).

The participants were tested on reading skills (decoding) in L1 with the Test-A tool (Panteliadou & Antoniou, 2008), on reading skills (decoding) in L2 with “The Burt Word Reading Test” (Burt & The Scottish Council for Research in Education, 1976), on spelling skills in L1 with the Spelling Test (Mouzaki, Protopapas, Sideridis, & Simou, 2010) and on spelling skills in L2 with “The South Australian Spelling Test (SAST)” (Westwood, 2005).

In particular, the test for L1 decoding included the reading of 24 pseudo-words using the phonological strategy, the reading of 53 real words using the spelling/phonological strategy and also the distinction between 36 real and non-real words. The test for L2 decoding included 110 real words that had to be read in isolation, printed in a different size and type and placed in a series of graded difficulty. In the spelling test for L1 the students had to write down 60 words they heard orally. The list of words began with those which had easier

spelling and ended up with more difficult ones. The L2 spelling test was exactly the same with the L1 spelling test. The only difference was that the number of words was 70.

After the administration of the pre-tests the intervention began. All students of the experimental group participated in small group instruction sessions. More specifically, five groups of four students were formed. The students had 45 minute lessons twice a week in a silent and isolated room for a 5-month period.

The intervention included:

- 1) Distinction of short and long sounds of vowels and symphonic complexes;
- 2) Reading words that contain clusters of vowels and vowels;
- 3) Separation of words into phonemes and synthesis of phoneme for word formation;
- 4) Vocabulary extension: meaning and spelling of graded difficulty words.

2.3. Statistical Analysis

In order to examine the statistical significance in English (L2) and Greek (L1) decoding and spelling skills before and after the intervention program, a nonparametric test (Wilcoxon test) for dependent samples was conducted.

3. Results

In **Table 1** the mean scores of the experimental group's L1 performance in each test for each linguistic skill before and after the intervention are presented.

In **Table 2** the mean scores of the experimental group's L2 performance in each test for each linguistic skill before and after the intervention are presented.

In **Table 3** the mean scores of the control group's L1 performance in each test for each linguistic skill are presented.

In **Table 4** the mean scores of the control group's L2 performance in each test for each linguistic skill are presented.

Table 1. Mean scores of the experimental group in L1 decoding and spelling skills before and after intervention.

	Pre-intervention		Post-intervention		z-score	p value	
	N	Mean	SD	Mean			SD
Decoding	20	94.65	3.13	102.20	1.88	-3.925	0.000*
Spelling	20	35.15	5.35	35.50	5.26	0.942	0.346

*Statistically significant difference ($p < 0.05$).

Table 2. Mean scores of the experimental group in L2 decoding and spelling skills before and after intervention.

	Pre-intervention		Post-intervention		z-score	p value	
	N	Mean	SD	Mean			SD
Decoding	20	31.45	6.52	45.45	9.13	-3.924	0.000*
Spelling	20	24.20	4.92	31.50	4.81	-3.942	0.000*

*Statistically significant difference ($p < 0.05$).

Table 3. Mean scores of the control group in L1 decoding and spelling skills.

	Pre-intervention		Post-intervention		z-score	p value	
	N	Mean	SD	Mean			SD
Decoding	15	97.40	4.17	98.73	2.84	-1.569	0.117
Spelling	15	33.60	5.30	34.80	5.94	-2.412	0.016

Table 4. Mean scores of the control group in L2 decoding and spelling skills.

	Pre-intervention		Post-intervention		z-score	p value	
	N	Mean	SD	Mean			SD
Decoding	15	33.20	9.54	33.60	9.53	-1.038	0.299
Spelling	15	23.13	5.37	23.53	5.18	-0.777	0.437

4. Discussion

The current study investigated the transfer of decoding and spelling skills from L2 to L1 after an intervention in L2 among students with LD. The findings of the present study indicate that the intervention program in L2 improved the performance of the participants in all English tests. Moreover, there was a similar improvement in L2 decoding but not in L2 spelling tests.

Regarding the first research question, our results showed that there was a statistically significant higher performance on the part of the experimental group in L2 decoding, after the intervention. This finding is in line with previous studies (Abu-Rabia & Bluestein-Danon, 2012; Abu-Rabia & Shakkour, 2014; Abu-Rabia, Shakkour, & Siegel, 2013) which also found an improvement in L2 decoding skills after an intervention was applied among students with reading difficulties. Concerning the second research question, the findings of the present study showed that there was an improvement in the L1 decoding skills of the experimental group after the intervention program. This finding supports the perspective that decoding is not language specific and that experiences in one language may reflect on other languages someone learns (Abu-Rabia & Siegel, 2002; Abu-Rabia & Sanitsky, 2010; Keung & Ho, 2009; Koda, 2007; Wade-Woolley & Geva, 2000) and also confirms the cross-linguistic transfer of this skill from the foreign language to the first supporting the CRT Hypothesis.

In terms of the control group, the results showed that there was no improvement in the participants' decoding skills neither in their L2 nor in their L1. This group had not received any intervention; therefore their decoding skills continued to be low in both languages since they were students with LD.

However, the spelling results of the experimental group revealed a different pattern; regarding the third research question, the L2 orthographic results of the experimental group improved as a result of the intervention. This finding is supported by other studies that also found an improvement in orthography after an intervention in L2 among struggling readers (Abu-Rabia & Bluestein-Danon, 2012; Abu-Rabia & Shakkour, 2014; Abu-Rabia, Shakkour, & Siegel, 2013).

Concerning the fourth research question, the L1 spelling skills did not present such an improvement. In other words the Greek orthographic skills did not improve since according to our results, the English orthographic experiences were not transferred to Greek (L1). This finding seems to be consistent with previous studies that did not find orthographic cross language transfer (Abu-Rabia & Bluestein-Danon, 2012; Abu-Rabia & Shakkour, 2014; Abu-Rabia, Shakkour, & Siegel, 2013; Wang, Park, & Lee, 2006; Wang, Perfetti, & Liu, 2005). Abu-Rabia & Siegel, (2002) claim that orthographic skills are language specific and therefore every language has unique orthographic rules. In order to get knowledge of a language's spelling, students need direct instruction but its results may not transfer to other languages (Abu-Rabia & Sanitsky, 2010).

As for the control group, their L2 spelling abilities did not show any improvement, a finding which was expected since they had not received any intervention in their L2, English. However, a little betterment was observed in their L1 spelling. This finding can be attributed to the cognitive development of the participants (Abu-Rabia & Shakkour, 2014), since their cognitive skills improve as they grow older and as a consequence their linguistic skills become better as well (Abu-Rabia, Shakkour, & Siegel, 2013).

In terms of spelling skills, there are studies which found that the bigger the similarity between two orthographic systems, the bigger the probability of orthographic transfer between the two languages (English and French) (Deacon, Wade-Woolley, & Kirby, 2009). In the present study, both languages belong to the Indo-European family, they are written from left to right but they have different alphabetic systems. An important difference between them is that the English language has a deep orthography (Abu-Rabia & Siegel, 2003; Kahn-Horwitz et al., 2005), whereas Greek a shallow one (Protopapas & Vlahou, 2009).

Overall, the findings of the present study showed that there was no improvement of decoding and spelling skills for the group of students with LD who did not attend an intervention program in L2. On the other hand, according to our results a significant post-intervention improvement in both decoding and spelling skills in L2 (English) and a significant post-intervention improvement in L1 (Greek) decoding but not in L2 spelling was found, supporting the fact that orthography is language specific and validating the CRT hypothesis (Abu-Rabia, Shakkour, & Siegel, 2013).

The present study also indicates that students with LD can benefit from interventions which target on linguistic skills in L2 which means that learning disabilities are not an obstacle for students who want to learn a foreign language even if this language has a deep orthographic system. On the contrary, a proper intervention program in L2 may have a positive impact on their L1 linguistic skills.

Therefore, these students should not be excluded from L2 classes especially nowadays that learning at least one foreign language is considered imperative in the modern multi-cultural societies not only for typical students but also for students with LD. Inclusion of these students in the L2 classes will not only help

them expand their linguistic knowledge but also enhance their feelings of acceptance and involvement into the learning process regardless of the level of achievement (Gallego & Busch, 2015).

To conclude, our findings point towards a new vision of foreign language education, which will take into account the specific educational needs of all children and will implement intervention programs that will facilitate the learning process of both L1 and L2.

Limitations and Directions for Future Research

There are some limitations in the present study that need to be taken into consideration. First of all, the small number of the participants does not allow the generalization of the results. Furthermore, the fact that the post-intervention tests were administered only once does not insure the duration of the benefits of the intervention program.

Future research with larger samples that are followed up for longer periods of time will validate the importance of implementing intervention programs in L2 and their impact on both L2 and L1 for students with LD. Future studies should further focus on how linguistic skills can transfer between languages in different linguistic domains and also how students (with or without LD) use the experience they gain in one language in order to approach another language. Moreover, it would be interesting for researchers to study the impact of the strategies that are applied in an educational intervention, on the facilitation of the transfer both from L1 to L2 and from L2 to L1. The results of such researches would be very helpful for designing intervention programs in L1 and L2 and promote language learning especially for students with learning disabilities.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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