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# Spelling with Developmental Dyslexia in English as a Second Language

A literature review

Josephine Almgren

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## Abstract

Today, the acquisition of a second language is viewed as an essential resource and in most cases, a vital task to be able to perform in order to be a part of society. However, different disorders such as dyslexia may impede this kind of acquisition. This literature review examines recent research regarding developmental dyslexia, spelling and learning a second language (L2), which in this case is the English language. The research questions of this review are twofold: (1) what conclusions can be drawn from recent research regarding developmental dyslexia, spelling, and English as a second language? (2) What implications for teaching do these findings suggest? It begins with giving a definition of dyslexia, followed by the prevalence of the disorder and a theoretical background. The results of the different studies indicate that if students have trouble with spelling in their L1, they will probably struggle even more to acquire the spelling in an L2. Particularly if the L2 is English, which is viewed as a more opaque language than many others. Various considerations about the studies' affordances in teaching situations are considered and brought up as well as the scarcity of previous research in the field.

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# 1 Introduction

Communication across borders has become of vital significance across our changing world. In today's society, where we have started to explore our world even more through the World Wide Web, travelling across borders and educate ourselves in different countries, it is even more necessary than it was back in the days to master a second language (L2). Language skills are essential to actually acquiring an L2, which is why researchers are investigating factors that impede such skills, in particular, dyslexia.

Dyslexia is one of the most frequent reading and writing disabilities encountered in classrooms all over the world. Therefore, teachers need to learn more about this field to be capable of helping students in need and become aware of the fact that there is a great deal of variation in the kind and level of language difficulties amongst people with dyslexia.

During the past few years, new studies have been conducted within the field of dyslexia. The majority of these studies have focused on the reading skills. This indicates the importance that reading seems to have amongst researchers while spelling has been somewhat neglected. Already in 1773, Noah Webster claimed that "spelling is the foundation of reading and the greatest ornament of writing" (as cited in Venezky, 1980, p.12). In other words, spelling is an important skill to acquire. More recently, Ehri (2000) emphasised that "it is easier to read words accurately in English than to spell them. Failure to remember one or two letters dooms a perfect spelling but not necessarily an accurate reading" (p. 24).

Therefore, this present paper seeks to explore what conclusions can be drawn from recent research regarding developmental dyslexia, spelling, and English as a second language. Furthermore, what implications for teaching do these findings suggest?

In chapter 2, theory of spelling is presented followed by a definition of the dyslectic disorder. Moreover, the prevalence of dyslexia and its causes are portrayed and the terms second language and foreign language are discussed. In chapter 3 and 4, different studies are brought up and various aspects are highlighted and discussed. Chapter 5 presents the conclusions and suggestions for further research.

## 2 Preliminaries

### 2.1 Theory of spelling

As many other language learning skills, spelling comprises different aspects that all play a part in the performance of the skill itself. Joshi and Carreker (2009) state that “spelling is an amalgamation of phonological, morphological, and orthographic knowledge” (p. 114). These types of knowledge will be explained below.

Phonological knowledge has been proven to have a significant role in spelling. Olofsson (2009) claims that “phonology is the teaching of sounds within a language and how they work in a language system” (my translation, p.17). He also states that phonological knowledge contributes to more understanding of how letters (graphemes) and sounds (phonemes) interact, but also how they do not interact. Read (1975) was one of the first to discover the connection between phonology and spelling when he found that spelling mistakes made by pupils were identical to how words were pronounced. Additionally, another study by Treiman, Goswami, Tincoff, and Leavers (1997) concluded that dialects affect spelling amongst both children and adults since the spelling of *car* differed between American (misspelled as *cr* or *kr*) and British children (misspelled as *ca* or *ka*) i.e. the word was spelled as it was pronounced. From these findings, one can conclude that phonological knowledge is how a written word reflects the pronunciation of a word in one’s head.

Morphological knowledge, as defined by Carlisle (1995) “focuses on children’s conscious awareness of the morphemic structure of words and their ability to reflect on and manipulate that structure” (p. 194). One can say that it reflects a human’s knowledge about adding and deleting suffixes, prefixes, grammatical inflections etc. that denote meaning e.g., *courage(ous)*, *walk(ed)* and *(un)fair*. Carlisle, McBride-Chang, Nagy and Nunes (2010) claim that “[m]orphemes are the smallest units of meaning in a language” (p. 465). These words can stand alone or together with prefixes, suffixes etc. to denote different grammatical meaning. To express when something occurred, gender and other grammatical inflections require the knowledge of morphemes. According to Carlisle et al., (2010) “[u]nderstanding of the morphological structure of words requires processing of phonology, semantics, syntax, and with regard to written language, orthography as well” (p. 465).

Orthographical knowledge is “the visual representation of a spoken language” (Joshi & Carreker, 2009, p. 116), i.e. letters you put down on paper. Treiman and Cassar (1997) state that students who are viewed as skilful in the field of writing know a great deal about

orthography. They have knowledge about spacing and “letter sequences” (Treiman and Cassar, 1997, p. 70). There is a distinction between transparent and opaque orthographies, where the former usually has one sound (phoneme) for every spelled unit (grapheme), whereas the latter “have multiple graphemes that represent one phoneme or multiple phonemes that represent a single grapheme” (Joshi & Carreker, 2009, p. 117). These different distinctions also indicate the difficulty of learning a language, where languages with more transparent orthographies (e.g., Italian, Finnish) are much easier to master than those languages with more opaque orthographies such as English (Joshi & Carreker, 2009).

## 2.2 Definition of dyslexia

There are two different branches of writing and reading disorders that some people struggle with: *acquired* and *developmental* impairments; the former is caused by acquired brain damage or disease whereas the latter constitutes a delayed development of one or several skills (e.g., reading, writing) (Nijakowska, 2010). Dyslexia can, thus, be divided into two categories: *acquired dyslexia* and *developmental dyslexia*. Nijakowska (2010) states that acquired dyslexia is caused by acquired brain damage or disease, which leads to the disability of reading that once already was attained, while developmental dyslexia is a disorder where people have a delayed development of writing or reading throughout their lives. Developmental dyslexia will be the focus of this literature review and henceforth be referred to as just dyslexia.

Throughout the years, many definitions of dyslexia have been proposed. In 1968, the World Federation of Neurology (WFN) was one of the first agencies to publish a definition of this developmental disorder, and claimed it to be:

[a] disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence and sociocultural opportunity. It is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin. (Snowling, 2000, p.15)

Recently, the International Dyslexia Association (IDA) published another definition and indicated that:

[d]yslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge (International Dyslexia, 2017).

In other words, dyslexia impedes a human being's acquisition of different skills, such as reading, writing and spelling. This does not mean that every developmental dyslectic person shows the same kind of symptoms. Instead, there is a great deal of variation between individuals with dyslexia.

## 2.3 Prevalence of dyslexia and its causes

The International Dyslexia Association (IDA) reports that about 15—20% of the world population suffer from dyslexia. Dyslexia is a writing and spelling disorder that can depend on many factors in an individual's surrounding. Biological factors, gender differences and kind of language can all play a part in the dyslexia disorder.

According to many researchers in the field, biological factors play a significant role in the disorder i.e. children can inherit the disorder from a parent. Several studies have reported that approximately 40—80 % of everyone who has been diagnosed with dyslexia has received it from a relative (Grigorenko, 2001). This means that parents who have got dyslexia will probably pass on the disorder to their children. However, researchers cannot state that there is one specific gene that causes the heritability of dyslexia; instead, there are said to be several genes that influence the disability (Svensson, 2009). What can be stated, on the other hand, is that it seems that the early development process of the brain is a process where you can discover genes that influence the reading and writing disorder later on in life (Svensson, 2009).

Gender differences is also a concept worth noting when talking about different aspects that might influence dyslexia. Gillberg och Ödman (1994) state that, according to many studies, more boys than girls have got the dyslectic disability. However, they also claim that in recent years, researchers have started to question this more extensive prevalence of

dyslexia in boys. Gillberg och Ödman (1994) suggest that it could be the later general development of boys that make them a more likely target of dyslexia.

Depending on what native language you speak and what country you live in, dyslexia can be more rarely or more frequently diagnosed. Languages have different transparency i.e. phoneme-to-grapheme correspondence (Glynn, Wearmouth & Berryman, 2006). Therefore, the spelling of some languages is easier to acquire than others. For example, English is classified as a more opaque language (not many phoneme-to-grapheme units of correspondence), which makes the language harder to spell and read, whilst Finnish, Italian, Greek and Spanish are classified as more transparent languages (Duranović, 2017) and consequently easier to spell and read since almost every phoneme corresponds with a grapheme that can be written on a paper. Since the spelling of transparent languages is easier to acquire, one can conclude that dyslectic students have more problems when trying to learn to read and write in opaque languages (Jacobsson, 2009).

## 2.4 Second Language (L2) and Foreign Language (FL)

*Second language (L2)* and *foreign language (FL)* are two terms used for the acquisition of another language than the mother tongue. Cook (2008) states that a second language is “a language acquired by a person in addition to his mother tongue [...]” (p. 2) but also “for immediate use within the same country” (p. 11). For instance, the language has to be acquired by people living in the community, for governmental purposes or being able to be a part of the society. In contrast, “a foreign language is for long-term future use in other countries” (Cook, p.11) For example, it could be used for educational purposes abroad, where the language is necessary to master, or for purposes of travelling, where the language has to be acquired for communication etc. This distinction is not deemed to be very relevant for spelling problems related to dyslexia since no difference between L2 and FL has been made in the examined studies in this literature review. *English as a second language (L2)* and *English as a foreign language (FL)* will be used interchangeably and hence be viewed as the additional language a student is learning in school. Henceforth, it will be referred to in the review as an L2.



### 3 Literature review

In this chapter, findings within the field of dyslexia and spelling will be reviewed. Research on L1 and dyslexia may shed light on L2 and dyslexia. Below, the literature review is divided into three sections: *Dyslexia and spelling in L1*, *Dyslexia and spelling in an L2* and *Pedagogical implications*. It should be noted that the ages of the dyslectic participants vary significantly between the studies included in this review; from kindergarten children to adults.

#### 3.1 Dyslexia and spelling in L1

Many studies in the field of dyslexia and spelling have involved participants divided into two groups, where one is considered to be the dyslectic group, while the other group is a control group consisting of students of the same age but without dyslexia. Such studies will be reviewed first and then studies comparing dyslectics to a younger control group.

In a study by Quémart and Casalis (2017), they examined how dyslectic, native speakers of French, ten to fifteen years old, tried to solve the most challenging task when trying to manage to spell in the French language: silent final letters. The focus in this case was morphological knowledge. Before the actual test, the participants had to do several other tests to measure their ability, but also to be matched with a student from the control group. Quémart and Casalis (2017) reported that the dyslectic group had less capability to use their phonological awareness. On the other hand, when students were supposed to create a new word that was related to the morphology of another word, there was no substantial difference between the groups. Some words in the test were accounted as not belonging to a family of morphology (e.g., *effort*), but still finished off with a silent letter, whereas the other group was said to include words with complex morphology and finished with a mute final consonant (e.g., <t> is silent at the end of the noun *tricot* but when a suffix is added, the <t> should be pronounced as in the verb *tricoter*). The survey showed evidence of the correlation between dyslectic students and their primary use of morphology, in contrast to typically developing students. In other words, Quémart and Casalis (2017) talk about morphology as a compensating tool to tackle the deficit of phonological knowledge that dyslectic students lack.

Schiff and Levie (2017) came up with a contrasting conclusion when they investigated Hebrew school children, youths and adults to find correlations between spelling and knowledge of morphology. The knowledge of morphology did not help the dyslectic students, especially if the morphology was complicated. The study was divided into three assignments:

“function letter spelling, a phonological awareness task and a morphological awareness task” (Schiff and Levie, 2017, Materials and procedure, para. 1, 3 and 4). The findings indicated that the dyslectic group had got significantly lower scores than the typically developing group on spelling and when the difficulty of morphology increased, the gap between the two different groups became even more apparent. Schiff and Levie (2017) also claimed that morphology played a huge part in the progressing of spelling since the spelling was “highly dependent on the extent to which morphology is reflected in the structure of the written word” (Schiff and Levie, 2017, Discussion, para. 2). Words which reflected easy morphology could be spelled much sooner than words with difficult morphology for people with dyslexia. Additionally, the phonological assignment was extremely hard for both groups.

One study that questions whether or not phonological difficulties are the essential hurdle within dyslexia was conducted by Duranović (2017). She examined what kind of spelling mistakes Bosnian dyslectic students tended to make in their native transparent orthography. The assignment involved a dictation task. The rate of difficulty enhanced gradually for fifty out of the eighty-five words and followed the pronunciation-to-letter rule, whereas thirty-five words were classified as “phonological alternations of consonants (assimilation by voicing, assimilation by place of articulation, loss of consonants)” (Duranović, 2017, p. 593), i.e. a sound is adapted to an adjacent sound. The mistakes made by the Bosnian students were divided into three categories: phonological errors, grammatical errors (morphology) and orthographic errors. The findings in the study once again demonstrate the difficulties that dyslectic students have with acquiring phonology (in accordance to Quémart and Casalis, 2017). 86% of the mistakes were categorized as phonological, 10% as orthographic mistakes and only 4% as grammatical mistakes. However, because of all the phonological mistakes made by students within the highly transparent Bosnian language (phoneme-to-grapheme rules), one may question whether the phonological knowledge is an important factor within dyslexia. Bosnian native speakers in general struggled with consonants and their phonology. Duranović (2017) suggested that “the omission indicates that the student does not notice all the sound components in the composition of words” (p. 598). Furthermore, according to Duranović (2017), it was evident that dyslectic children utilised the same kind of strategies as normally progressing children and made the same type of mistakes, but the dyslectic students’ spelling performance was much weaker than the normally progressing students.

Another study analysed the writing performance that Dutch dyslectic students with an academic background had attained (Tops, Callens, Van Cauwenberghe, Adriaens &

Brysbaert, 2013). The study consisted of two parts: sentence dictation and writing a summary of a text. The results of the study demonstrated that there were three categories of spelling errors amongst dyslectic students: morphosyntactic (inflected words i.e. morphology), memory-related (has to be remembered, no letter to sound correspondence), and phonological errors. Of all three categories, dyslectic students tended to make more memory-related and phonological mistakes and fewer morphosyntactic errors, which is in accordance with Quemart and Casalis' (2017) assumption about morphology as a compensating tool. Tops et al. (2013) suggested that it could be due to the morphological teaching that had been emphasised throughout the years in school. However, the dyslectic students tried to avoid spelling longer words. Additionally, the non-dyslectic students also made all three categories of errors, but not as frequently as the dyslectic students. Teachers in practice were asked to assess the text summaries, but at this stage, the spelling errors had been deleted. Nevertheless, the dyslectic students were given lower marks than the control group when sentence structure and vocabulary were in focus, which indicated the severe problems that dyslectic students not only have with spelling but also with other aspects of writing.

Later on, Tops, Callens, Bijn and Brysbaert (2014) analysed Dutch-speaking adolescents and their range of spelling mistakes in phonology, orthography and grammar. This study was part of a longitudinal study in Belgium. There were two individual tasks: a word-spelling test, which had to be completed on a computer, and a sentence dictation task carried out with paper and pen. The results confirmed that students with dyslexia made more spelling mistakes than their peers. Phonological errors were frequently seen, whereas mistakes regarding grammar were rarer. However, in similarity to Tops et al. (2013), orthographic mistakes were found to the same extent in both groups, which could establish the correlation between memorisation and orthography. In other words, a person has to commit the spelling of a word to his/her own memory.

Additionally, a study conducted by Kemp, Parrila and Kirby (2009) investigated spelling problems that dyslectic English university students tended to make. The study divided the spelling of both real and pseudo words were the connection between the base word and the derived form was categorised into four categories. The first group involved words that were pronounced and spelt alike in both the base and derived form e.g., *apt-aptly* (simple phonological). The second group included words with identical spelling in the base word ending and the derived form e.g., *ash-ashen* (complex phonological). The third group consisted of words where the spelling and pronunciation of the base word ending and derived form was identical e.g., *deceit-deceitful*. However, these words could be potential spelling

obstacles to students since “one or more of its sounds could be spelled with one or more letters” (Kemp et al., 2009, 111-112) i.e. one has to learn these words or guess (simple orthographic). The last group division involved words which one had to know the orthographical spelling rules behind e.g., the *y* to *i* shift in *plenty-plentiful* (complex orthographic). The findings in the study confirmed the hypothesis that dyslectics have problems with the spelling of both real and pseudo words. The phonological real-word category was where all students performed at their best, which is contradictory to studies that claim that phonological knowledge is least attained by dyslectic students (e.g., Quémart and Casalis, 2016). On the contrary, the performance of producing simple orthographic words (SOWs) was least attained by the dyslectic group, whereas the complex orthographic words (COWs) were easier to spell for the dyslectic students. According to Kemp et al. (2009), the explanation for this may be that COWs “contain rule-based patterns, such as the *y* to *i* shift in *worry/worrisome* [...]” (p. 122), while SOWs contain sequences of letters which have to be memorized. Furthermore, Kemp et al. (2009) suggested that “phonological knowledge can act as a bottleneck for the development of orthographic knowledge” (p. 121) since no signs of orthographical knowledge as a compensating tool for the phonological knowledge deficiency could be detected.

There are also studies comparing dyslectics to younger non-dyslectics. One study carried out by Bourassa and Treiman (2003) concluded from their analysis of a spelling test, that dyslectic native speakers (seven to fourteen years old) of English perform equally well in spelling in their native language as typically younger developing children (kindergarten to third grade). The study included two tests, one written spelling test and one oral spelling test (the student had to spell the word by pronouncing every letter aloud). Ten words and ten non-words had to be completed within every test. The survey implied that many more mistakes were made during oral spelling than written spelling within both the dyslectic group and the non-dyslectic group. Also, when working with non-words, children in general had a huge advantage to write them down on a paper rather than to spell them orally. Bourassa and Treiman (2003) claimed that “this result suggests that a written record is especially helpful when phonological skills are stressed [...]” (p. 326). Furthermore, the same kinds of mistakes and spelling patterns could be detected within both groups of children in the study. This further underpins the similarity between dyslectic children and younger typically developing children.

Additionally, Bourassa, Treiman and Kessler (2006) examined whether the use of morphology knowledge could be a resource for American students to tackle “a phonological

segmentation problem [and] deal with the one-to-many mappings between sounds and letters in the English spelling system”(p. 708). The experiment included a group of dyslectic students aged 9 to 14 and a group of typically developing students without dyslexia aged 6 to 8 years were given a dictation task. Similar to Quémart and Casalis (2016), Tops et al. (2014), and Duranović (2017), the results indicated that dyslectic students have problems with phonology. In this case, it was due to flap spelling mistakes. A short touch of the palate with the tip of your tongue that is very common in North American accents for both intervocalic <d> and <t> as in *writer* and *rider*. Furthermore, the results show many spelling similarities between the dyslectic students and the younger typically developing students, which could indicate how far away the dyslectic students’ spelling capacity is from other students of the same age.

Both Bourassa and Treiman (2003) and Bourassa et al. (2006) revealed how far away the dyslectic group was from their equal peers who had developed their spelling ability in average pace. Once again the phonological knowledge was present as an essential aspect to master when spelling.

Finally, a study that comprised a dyslectic group, a same age non-dyslectic group, and a younger control group were conducted in the Czech Republic by Caravolas and Volín (2001). They examined if dyslectic students had trouble with phonological knowledge when they were learning a transparent language. The study included three different groups with 43 participants in each group. The first group consisted of dyslectic participants (nine to twelve years), the second group included non-dyslectic participants of the same age as the dyslectic group and, the third group consisted of non-dyslectic younger children (seven to ten years). Before the actual test, every participant had to take a screening test and according to what the dyslectic participants scored, they were assigned a correspondent participant in the typically progressing group as well as in the younger age group. The spelling test showed signs of the problems that Czech dyslectic children have with acquiring a language with transparent orthography. First, it seems that Czech dyslectic students have the same kind of spelling capacity as younger normally progressing children because they make the same kind of errors. More specifically, dyslectic students perform equal to two or three years younger students with no disability, which is in accordance to Bourassa and Treiman’s (2003) study. Second, even though their research focused on phonological errors, they acknowledged that “a universal difficulty of dyslectics functioning in alphabetic writing systems is learning the conventions of the orthography” (Caravolas & Volín, 2001, p. 242).

## 3.2 Dyslexia and spelling in L2

In this part of the review, dyslexia and spelling in an L2 setting will be dealt with. A similar order of presentation as in section 3.1 is applied. Dyslectic students and typically progressing non-dyslectic students of the same age will be treated first.

A recent study by Łockiewicz and Jaskulska (2016) investigated spelling problems that dyslectic Polish students of English had made. Based on a questionnaire and the reading of words and non-words (pseudo words), they found that Polish dyslectic students produced more phonological and orthographic spelling errors than a control group. However, phonological spelling mistakes occurred more often. This implies “that grapheme-to-phoneme conversion difficulties are an important symptom in L2 with a different degree of transparency from L1” (Łockiewicz & Jaskulska, 2016, p. 260).

A similar study conducted in a Swedish speaking context in Finland is Lindgrén and Laine’s (2011) study. They compared same-age dyslectics and typically progressing students of English. Their results showed signs of the phonological and orthographical knowledge that dyslectic students lacked. Their participants were students at university level, either native speakers of Swedish or Finnish and had English as an L2. All three languages were examined and the participants had to do a dictation task and a free writing task. As presumed the dyslectic students made more spelling mistakes in Swedish, Finnish and English. It could also be seen that the dyslectic group made more “exchanges of sounds/letters with a minimal phonemic contrast in manner [...] e.g., park-part” (Lindgrén and Laine, 2011, p. 758), more mistakes regarding how the wrong pronunciation/spelling of words could lead to the correct pronunciation/spelling of another word and “morphophonological errors on inflectional endings” (Lindgrén and Laine, 2011, p. 759) in the English language. Another finding suggested that dyslectic students’ L1 spelling ability will affect the L2 spelling capacity in a negative way i.e. dyslectic students will have more severe problems with producing correct spelling in their L2 than in their L1.

A study including a younger control group (ten years old) than the dyslectic group (twelve to fourteen years old) is Andreou and Baseki (2012). They investigated spelling (orthographic) and phonological errors made by students with Greek as their mother tongue and English as their foreign language. The study focused on two writing tasks (the first in Greek and the other one in English) that students had to do. Students had to interpret “series of pictures” (Andreou and Baseki, 2012, p. 597) and then write a story about what they saw in the pictures. They used a recording tool called ScriptLog, which records every happening

(keys that are pressed, pauses etc.) on the computer. The study indicated that the dyslectic students made many phonological and orthographic errors in Greek as well as in English, which means that spelling may be an issue in both languages. However, there were more phonological errors in their foreign language than in their mother tongue. Andreou and Baseki (2012) propose that the explanation for this could be that English has a phonological system that is hard to acquire because of the relative opaque orthography. Furthermore, it seemed as if dyslectic pupils relied on a strategy where they spelled words as they were pronounced in English.

Some studies of dyslexia and second language spelling acquisition have also treated a potential difference between more proficient and less proficient dyslectic students. For example Helland and Kaasa (2004). They investigated a group of Norwegian dyslectic 6<sup>th</sup> and 7<sup>th</sup> graders regarding their performance in English as L2. The dyslectic group was divided into two sub-groups according to what they had scored on an L2 comprehension test. Those who had scored above the median (C+) were placed in one group while those scoring below the median (C-) were placed in another group. Later on, they had to do another test. The performance of each dyslectic individual was then compared to a control group with no reading or writing disabilities. The results of this study illustrated that spelling is the skill that dyslectic students had most trouble with compared to e.g., reading. Both groups of dyslectic students scored equally low on spelling, which implied that spelling is a huge problem amongst dyslectic learners of English. Moreover, the orthographic spelling mistakes analysed in the study indicated that the spelling of L1 affects that of L2, but also that English (L2) spelling affects that of Norwegian (L1).

Another investigation where the division between proficient and less proficient dyslectic students can be seen is in a recent longitudinal study conducted in Belgium (van Viersen, de Bree, Kalee, Kroesbergen and de Jong, 2017). They investigated whether talented dyslectic students performed better than “averagely intelligent students with dyslexia” (van Viersen, de Bree, Kalee, Kroesbergen and de Jong, 2017, p.1174) in foreign language proficiency. Also, they wanted to see whether there was a correlation between native language and foreign language proficiency skills. The first year (7<sup>th</sup> or 8<sup>th</sup> grade), native speakers of Dutch, all in secondary education carried out the survey. The year after, the same students were assessed again (8<sup>th</sup> or 9<sup>th</sup> grade). All students were classified into four different groups: “dyslexia, gifted/dyslexia, typically developing, and gifted” (van Viersen et al., 2017, p.1174). The English spelling test included two assignments whereas the Dutch spelling test consisted of one. One of the English spelling assignments and the Dutch assignment consisted

of ten sentences, where the students had to write down the focus word after it was read aloud. The second orthographic English test was a recognition task where students were supposed to find the correctly spelled word within a list of forty words. In the task, every correctly spelled word was matched with an incorrectly spelled word, but both of the words had the same pronunciation (e.g., *kat-cat*). Findings indicated that gifted students with dyslexia performed better on Dutch spelling than the averagely proficient dyslectic students. Another finding suggested that Dutch (native language) could affect English skills (foreign language) since “language-specific factors can be responsible for higher FL literacy levels than expected based on the NL” (e.g., Bekebrede et al., 2009; Morfidi et al., 2007, as cited in van Viersen et al. 2017). Finally, it could be detected that gifted students with dyslexia performed almost equally high as the typically developing students, whilst other dyslectic students made a poor performance. Explanations for the different performance within the groups could be due to the “differences between the FLs in orthographic depth” (van Viersen et al., 2017, p. 1188) where Dutch is considered to be a semi-transparent language, whilst English is regarded as an extremely opaque language.

Lastly, there is a study comparing dyslectic students to both typically developing students and a group of students that had difficulties to acquire English (ELD, without being diagnosed with dyslexia). In a recent study conducted by Palladino, Cismondo, Ferrari, Ballagamba and Cornoldi (2016), the aim was to analyse spelling mistakes Italian students tended to make in English. It was an individual dictation task which involved words considered to be highly recognisable for the age group. None of the words could be spelled correctly using Italian phoneme-to-grapheme rules. As other studies have indicated (e.g., Łockiewicz & Jaskulska, 2016), the findings within this study demonstrated the significant problems that dyslectic students have with phonology compared to the other groups of students (typically developing). The lack of phonological knowledge could also be found within the ELD group. Additionally, many spelling mistakes could be detected in the dyslectic group even though the words should be familiar to the student. In accordance to Lindgrén and Laine (2011), this may emphasise the correlation between L1 and L2 learning, which could suggest that difficulties in L1 lead to difficulties in L2 as well. Furthermore, when dyslectic students tried to spell a word, a mixture of different spelling mistakes could be seen, which would assume that the students relied on both their L1 and L2.



### 3.3 Pedagogical implications

In several of the studies reviewed above, pedagogical implications have been emphasized as the key to foster successful dyslectic students. In some studies regarding dyslexia and L1 treated in section 3.1, different aspects of teaching spelling have been put forward.

The study by Treiman and Bourassa (2003) proposed that dyslectic students would gain more spelling knowledge with teaching that concerns consonant clusters, since both dyslectic students and typically progressing students had trouble with this kind of language acquisition. Furthermore, remedial teaching could be the key to help dyslectic students overcome the obstacles of spelling, such teaching should be developed to support students' comprehension of language acquisition.

Likewise, Tops et al. (2013) also underpinned the importance of remedial teaching for high functioning dyslectic students. Furthermore, they claimed that spelling support, concerning software applications, could benefit dyslectic students and that the remedial teaching could aid students to develop their writing skills.

However, Tops et al. (2014) suggested that an important aspect to consider when teaching was to work with error analysis and make students aware of what words could be potential spelling obstacles. However, in similarity with Treiman and Bourassa (2003) and Tops et al. (2013), remedial teaching could assist dyslectic students in their strive for accurate L2 spelling.

Kemp et al. (2009) were also in favour of remedial teaching for high-functioning adult dyslectics. These dyslectic students were in need of spelling practice even though they coped with their university studies. The remediation teaching should focus on further development of their spelling ability. "Specific instruction in the use of more complex phonological and orthographic spelling rules, as well as targeted practice in the use of morphological links between words [...]" (Kemp et al., 2009, p. 125), are all factors that possibly could assist these students in their spelling ability progression.

Another aspect that is considered to be highly valuable is the teaching of morphology in classrooms. Schiff and Levie (2017) emphasised that teachers with dyslectic students (adults and children) who were developing their spelling ability were in need of effective morphological teaching to be able to spell in Hebrew.

Likewise, Quémart and Casalis (2017) pointed to the importance of teaching morphology to students with dyslexia, for instance, teaching "morphologically related words" (Quémart and Casalis, 2016) e.g., *adore-adorable*, as well as spelling strategies concerning

morphology. The spelling strategies could involve the categorisation of words depending on how they ended and demonstrated the sound-to-letter correspondence e.g the various spelling of one sound in the English language.

In similarity, Bourassa et al. (2006) claimed it to be important to teach dyslectic students that morphemes were frequently spelt in a “consistent fashion” (p. 713). Morphological knowledge and structure needed to be highlighted more in teaching situations. Additionally, students needed to be instructed about English phonology.

Although several studies on dyslexia in L1 bring up pedagogical implications, such aspects are only treated in one of the L2 studies reviewed in the present report. Palladin et al. (2016) stated that phonological difficulties should be in the centre of attention when teaching L2 spelling to dyslectic students. To enhance dyslectic students spelling in their L2, teachers need to enlighten students about basic phonological procedures and thence develop these. On the other hand, they stated that Italian dyslectic students “appear to feel comfortable if they can rely on general, stable principles” (Palladin et al., 2016). The teaching in this case would then embrace the spelling of whole words and use a non-phonological approach. Furthermore, they advocated more vocal production for dyslectic students but to also have patience with dyslectic students’ spelling performance. However, they also claim that if verbal production tasks are utilised very often by teachers, dyslectic students might not learn how to perform other skills than oral production, which later on will affect their L2 proficiency badly.

Last of all, one new study in this literature review, examined the efficiency of different spelling strategies when teaching dyslectic Chinese secondary students (Wai, Chan & Chen Zhang, 2014). Various teachers were interviewed regarding what they believed was the most effective spelling strategy: “the phonological strategy, an integration of phonological and orthographical strategies, the rule-based strategy, the visual-imagery strategy and teaching spelling with other skills” (Wai, Chan & Chen Zhang, 2014, p. 15-16). The interviews revealed that 60% of the teachers considered the phonological spelling strategy as the most essential one, 23% reckoned the rule-based strategy as the most effective one, whereas, 17% emphasised an amalgamation of the rule-based and phonological strategy i.e. to alter between the different strategies in a learning situation could be considered to be the most effective one. Furthermore, helping all students “to form a habit of decoding words systematically can bring the biggest benefits to students, especially those with dyslexia because they have deficiencies in referring sounds to letters and in decoding” (Wai, Chan & Chen Zhang, 2014, p. 22).

## 4 Discussion

This literature review has examined recent research regarding spelling with dyslexia in an L1 and an L2. As can be seen in chapter 3, many studies point towards different directions regarding the spelling errors dyslectic students tend to make. In other words, it is not easy to draw pedagogical conclusions. However, Tops, et al. (2014) point out a crucial fact to have in mind:

[I]t is clear that no matter which error type researchers are investigating, they are bound to find a big difference between students with dyslexia and control students [...]. This easily leads to the impression that the type of error examined is particularly affected, when a study is limited to one type of error only. (p. 302).

Therefore, it would be fascinating to examine orthographic, phonological and morphological knowledge together, since all these aspects play a part when spelling.

In L1 and L2 studies that concern at least two of the three aspects of spelling (orthography, phonology and morphology), phonological knowledge seems to be the aspect where most dyslectic students have shortcoming. However, the focus in these studies may have affected this answer since the different studies have chosen to investigate the phonological knowledge in more specific terms. On the other hand, similarities between the L1 and L2 phonological mistakes could be detected, which may emphasise the importance phonological knowledge has for spelling in both languages.

Another aspect that could be questioned is how people in the studies have diagnosed dyslexia. Kemp et al. (2009) state that the dyslectic group involves university students that had difficulties with reading and spelling. One may therefore question where the line between dyslexia and difficulties with reading and writing should be drawn and if there are any regulations regarding this. Instead of dyslexia, the reading and writing difficulties might be due to other factors such as not appropriate teaching. This may also be questionable in the study by van Viersen et al. (2017). Since the high-performance dyslectic group performed equally well as the typically developing students, one may question whether the dyslectic students should be viewed as dyslectic students or whether the typically progressing students should be diagnosed with dyslexia.

Many of the studies that bring up pedagogical implications have highlighted the teaching of morphology as a critical factor even though it seems as if phonology is the

knowledge that dyslectic students primarily lack. However, since the majority of studies reviewed only focused on one or two aspects (phonological knowledge, morphological knowledge, orthographical knowledge) and not all studies raised the question regarding pedagogical implications, it might not be applicable in every teaching situation since not all aspects are considered. On the other hand, these teaching implications for morphology could be relevant along with other teaching strategies concerning phonological and orthographical knowledge. An alteration between different spelling approaches appears to be the most effective teaching strategy (Wai, Chan & Chen Zhang, 2014), since the various degrees of spelling difficulties could be detected in different ways, depending on which dyslectic student the teacher tries to help.

One aspect that dyslectic students seem to utilise a great deal is their knowledge of morphology. As stated in chapter 3, Quémart and Casalis (2017) make a compelling assumption about morphology used as a compensating tool for dyslectic students' lack of phonological knowledge. This further emphasises the efficiency that phonological knowledge has with spelling and how dyslectic students struggle with this knowledge. Even though morphological knowledge contributes to the skill of spelling, one has to be able to master the phonological knowledge to some degree as well. One reason for the compensation may be due to the kind of teaching received during their school years where grammatical teaching has been emphasised.

Furthermore, many of the studies promote remedial teaching as a key to dyslectic students. The remedial teaching could constitute a necessary aid for the dyslectic students. However, it is not clear if this kind of teaching is used in Swedish schools today.

Since 15—20% of the world's population suffer from dyslexia, teachers in the field need to be educated and read up on this area. The Swedish Agency of Education claims "it is also important that teachers know different methods to be able to help students with dyslexia" (my translation, Skolverket, 2016). However, the question remains, whether or not teachers in the field are being educated within this important area or if it is a teacher's own responsibility to be able to help students in need.

Moreover, the Education Act states that "in education, respect shall be shown to children and students' different needs. Children and students shall have the support and stimulation to develop as far as possible" (my translation, SFS 2010:800). This further emphasizes the importance of the right tools and teaching needed for dyslectic students. However, in this literature review, only one study points to the importance of software applications as a resource for the dyslectic students (Tops et al., 2013).

Additionally, it has been difficult to compare studies when the age spans are so varied between the different studies. Depending on their age, students have gained different amount of spelling knowledge and this could possibly lead to different results in the studies. However, this could give a good overview of varying spelling struggles within the different age groups and potentially lead to a better understanding of the different mistakes in each age group.

One truth that Palladino et al. (2016) and Lindgrén and Laine (2011) seem to agree on, is that if dyslectic students have trouble with spelling in their native language, they will probably struggle even more when trying to acquire spelling in their L2, especially if the students are supposed to learn the spelling of English, which is viewed as a more opaque language than others. Possibly, this may be due to the size of vocabulary acquisition in an L2, which usually is more limited than in one's first language (L1).

In some of the studies analysed in the present literature review, the authors state that dyslectic students and non-dyslectic students use the same kind of spelling strategies. In other words, one would assume that the different groups could be taught in the same way when dealing with spelling in an L2. However, according to several of the studies reviewed, dyslectic students seem to perform with a similar spelling capacity as younger normally progressing students, or even more specifically, approximately three years younger (Caravolas & Volín, 2001; Bourassa & Treiman, 2003). This gives indications of how far away the dyslectic students are from students with the same age and might show how the level of spelling teaching has to be altered between the different groups to encompass the different spelling capacities.

## **5 Conclusion and further research**

As can be seen in this literature review, spelling, dyslexia and second language learning is a somewhat neglected research area at the moment. It has been rather difficult to interpret specific studies because of the different age groups, the vague division of dyslectic and non-dyslectic students as well as the different focus within each study that has taken different spelling aspects into account and not comprised all of them (phonological, morphological and orthographic knowledge).

From previous research, it seems that insufficient phonological knowledge is an important aspect for many dyslectic students in both the spelling of an L1 and L2. Phonological knowledge is not only utilised by dyslectic students, but also by typically progressing students. In other words, it seems to be that typically developing students and

dyslectic students use the same kind of strategies when trying to solve the difficulty of spelling. This further indicates that L2 spelling strategies can be taught in the same way to both dyslectic and non-dyslectic students but at different levels, since the dyslectic students have a similar spelling progression as younger typically developing children.

There are some conclusions that can be drawn from the findings within some of the studies. Firstly, several researchers seem to agree on the fact that a dyslectic's spelling ability will be even worse in their L2 than in their L1, particularly, if the L2 is English, which is considered to be a more opaque language compared to others i.e. not much phoneme-to-grapheme (sound-to-letter) correspondence. Possibly, this could be due to the vocabulary acquired in each language, where the learned vocabulary in an L2 would be of less extent than in a native language.

Secondly, according to several of the studies, remedial teaching is an essential aid for dyslectic students and needs to be emphasised more in Swedish teaching contexts. Furthermore, the alteration between different spelling approaches seems to be the best way to cater for different dyslectic students since the variation of the disorder can act in different ways in various individuals.

Further research needs to be conducted within the field of dyslexia, both considering first language spelling, but especially second language spelling. All three aspects of spelling, L2 and dyslexia need to be comprised and examined all together which could result in guidelines of how to teach L2 spelling to dyslectic students. Lindgrén and Laine (2011) carried out an interesting study that could be replicated for future research, but with more focus on each of the three aspects of spelling. Additionally, since the National Agency of Education gives insufficient information about how teachers should assist dyslectic students in the Swedish school context, and because of the sparse amount of research already conducted within the field, more research is needed to make sure that teachers know how to help dyslectic students in their L2 spelling progression. Lastly, new studies need to examine whether or not teachers in Sweden know how to handle dyslectic students in the classroom, but also if teachers believe that they have the right knowledge about the disorder to be capable of helping dyslectic students with their spelling development.

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