English Spelling Capacities of Typically Developing and Dyslexic Dutch Secondary School Pupils

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(McCracken)

Name: Manon van Beelen

Student Number: 3650804

Supervisor: Dr. M.C.J. Keijzer

Second reader: S. Domen

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Introduction

It is becoming increasingly difficult to ignore the high number of pupils diagnosed with dyslexia in secondary education. Dyslexia as a term was used to refer to severe reading difficulties (Gersons-Wolfsenberger and Ruijssenaars 209), but it seems to cause various other difficulties in addition to reading problems as well, which is why dyslexia is nowadays more broadly described as a learning disability. Moreover, various studies using functional brain imaging in dyslexic readers have shown that dyslexia is neurobiological in its origin, this justifying its classification as a domain-general learning disorder (Lyon, Shaywitz, and Shaywitz 2).

Although considerable research has been devoted to dyslexia as a learning disability, rather less attention has been paid to what having a dyslexic pupil in a classroom actually means for the teaching practice at large. In principle, all schools and teachers in the Netherlands are familiar with dyslexia; they know that dyslexic pupils are likely to encounter difficulties during reading and to make more spelling errors. More than anything else, dyslexic pupils are expected to encounter most problems in the English as a foreign language classroom, due to the language's complicated (also known as deep) orthography (Bekebrede et al. 755).

The purpose of this study is to investigate whether Dutch secondary school pupils in a first-year HAVO/VWO (the highest educational level in the Netherlands) class are sensitive to the English spelling system. Various tests were incorporated in this study to test the pupils' spelling capacities. First of all, both a Dutch and an English (productive) dictation were administered. Furthermore, a Dutch and an English (receptive) spelling selection task were also included in this study. Lastly, a Dutch and an English reading task were incorporated in this study as well. All this was done in order to test the reading capacities of the dyslexic pupils, but also to compare these to those of typically developing pupils. Of special interest in

this study is the question whether dyslexic pupils and typically developing pupils produce different results on the various tasks. More specifically, the aim of this study is to assess whether dyslexic pupils consistently underperform in relation to their typically developing peers. The results of this study are subsequently used to identify implications for the English foreign language classroom with regard to dyslexic pupils.

Chapter 1: Theoretical Framework

1.1 A definition of dyslexia

Ever since the end of the nineteenth century, dyslexia has been used to refer to severe reading difficulties (Gersons-Wolfensberger and Ruijssenaars 209). However, dyslexia seems to cause various other difficulties besides reading problems, and a more precise definition is therefore needed. Dyslexia is more accurately defined as a learning disability (LD), and of the entire LD population, at least 80 percent is diagnosed as dyslexic. Moreover, dyslexia is neurobiological in origin; various neurobiological research projects using functional brain imaging in dyslexic readers show a failure of neural systems which are used to function properly during reading (Lyon, Shaywitz, and Shaywitz 2). Figure 1 identifies three areas in the brain that are usually involved during reading: the parietal-temporal area (1), used to analyse written words; the occipital-temporal area (2), used for direct word recognition, and lastly, the inferior frontal gyrus (3), which is used for articulation and to read silently ("Dyslexie en Dyslcalculie").

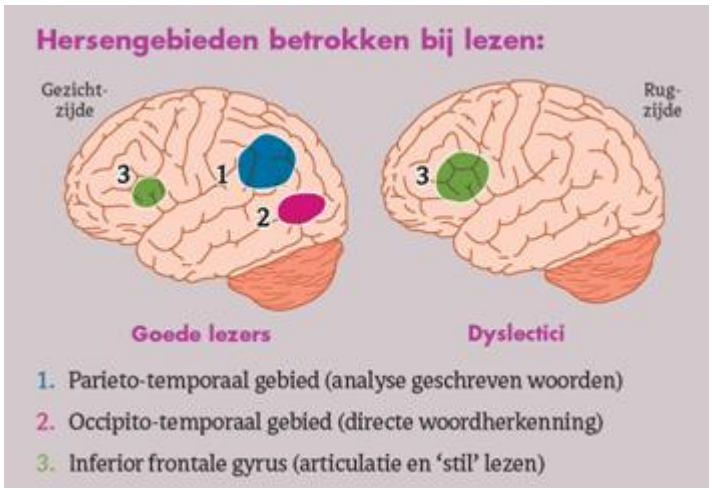

Figure 1: Brain structures involved in reading ("Dyslexie en Dyscalculie")

Whereas in non-dyslexic readers, all three areas are active during reading, in dyslexic readers only the inferior frontal gyrus is active. This results in dyslexics having difficulties analysing words and in particular struggle with word recognition during reading. In addition, it is thought that dyslexia is genetically transmitted and that it affects 10 to 15 percent of the entire population. It is finally important to state that no correlation has been found between dyslexia and intelligence (Jacob, Wadlington, and Baily 364).

This neurological deficit translates into common characteristics that are often associated with dyslexia, including difficulties in word recognition, an inability to read fluently, and severe spelling disabilities, which could be the result of a deficit in the phonological component of language. When reading, readers link the various characters to the phonologic segments they represent. In order to make that connection, readers need to be aware of the fact that all words can be decomposed into phonological segments. This awareness is typically lacking in dyslexic children and adults, hence the various difficulties they experience. Due to the phonological deficits, dyslexic children and adults might also experience other difficulties such as difficulties in reading comprehension and acquiring new vocabulary, but also concentration problems, which could lead to extreme disorganisation (Lyon, Shaywitz, and Shaywitz 7).

Dyslexia must be diagnosed, and despite the fact that dyslexia cannot be predicted, some risk factors can be identified. A main risk factor is the failure of phonological skills to develop; dyslexic children often learn to talk at a later age than non-dyslexic children. Furthermore, it is thought that dyslexia is genetically transmitted, and thus a family history of severe reading problems can be regarded as a risk factor as well. In addition, articulation problems, concentration disorders, and motivation problems are risk factors as well (Gersons-Wolfsenberger and Ruijssenaars 210). According to *Het Protocol Dyslexie Voortgezet Onderwijs: Deel 2: Signalering, diagnose en begeleiding*, teachers can observe the following

signals in pupils as risk factors of dyslexia during class (see Henneman, Kleijnen, and Smits 15):

- A pupil cannot keep up with the rest of the class.
- Grades for Dutch and the modern foreign languages are relatively low.
- A pupil spends a disproportionally long time on his/her homework.
- A pupil shows withdrawal or overly excited behaviour during class.
- A pupil fears his/her study results and tries to avoid test moments more often than usual.

1.2 Frequently occurring difficulties for dyslexic pupils when learning English as a second language at secondary school

According to *Het Protocol Dyslexie Voortgezet Onderwijs*: *Deel 1- Achtergronden, beleid en Implementatie*, dyslexic pupils are likely to experience difficulties on the following three areas:

- Reading and/or spelling words in both Dutch and the modern foreign languages
- Reading texts for all subjects quickly and accurately
- Spelling quickly and accurately during writing for all subjects (Henneman, Kleijnen, and Smits 11)

When learning a second language in secondary school, all pupils are expected to read, write, listen, speak and spell properly in this language. Additionally, pupils are also expected to comprehend and apply the grammar of a foreign language properly and to acquire new vocabulary. For dyslexic pupils, some of these tasks will more than likely lead to severe difficulties.

A major stumbling block for dyslexic pupils is reading. It will take dyslexic pupils longer to recognise words. Even a text dyslexics have seen and read before is likely to cause

difficulties for them (Van Berkel 34). These problems are confounded in the English language classroom. It could be argued that a major reason why dyslexic pupils experience these difficulties is because of the English spelling system; it is very inconsequent and, moreover, very different from the Dutch system. As a result, dyslexic pupils tend to guess the words they do not recognise on the basis of a combination of letters they do recognise (Van Berkel 35). When dyslexic pupils are asked to read out loud during class, the difficulties they experience are very perceptible. Teachers are not always aware of the fact that reading out loud is not an exercise in which the pupils' pronunciation is tested, but rather an exercise in which pupils are tested on their technical comprehension and word recognition, which is ultimately what makes reading so difficult for dyslexic pupils (Van Berkel 33).

Furthermore, pupils are often confronted with writing tasks in secondary education; during exercises taken from their regular course books, but also during tests in which pupils are tested on their vocabulary, grammar, and on their writing skills. Spelling can hereby cause various difficulties for Dutch dyslexic pupils. Dutch has a so-called transparent orthography, which means it has relatively consistent phoneme-grapheme correspondences. English, however, can be classified as possessing a deep orthography, which means it has many inconsistent phoneme-grapheme correspondences (Bekebrede et al. 755). In principle, the English spelling system can be classified into four orthographic categories. First of all, there is the basic orthographical category, which contains words in which the sounds always, or very often, correspond with the spelling. An example of this spelling would be the <a> in *cat*; the /ae/ sound is always spelled with an <a>. The second category is the so-called rule orthography, and results from applying spelling rules. For example, the consonants <f>, <l>, and <s> are doubled at the end of a word, as in *stuff*, *full*, and *miss*, whereas only one <f>, <l>, and <s> is perceived auditorily. By applying this spelling rule, it is possible to arrive at the correct spelling. Third is the imprint orthography (also referred to as logographical

spellings), consisting of words with no, or very few, phoneme-grapheme correspondences. There are no rules to capture the various orthographies for the same sounds. In other words, pupils must imprint these various orthographies. For instance, the sound /eɪ/ in English is spelled differently in various words: *th**ey,** r**ai**n, br**ea**k, **eigh**t,* and *v**ei**n* (Van Berkel 59). The last category is defined as construction orthography (or morphological spellings), which requires the pupils to analyse the building blocks of words. For example, in the words *middle* and *handle*, an <el> sound occurs in the last syllable of these words, but this sound is spelled as <le> in both words. In order to avoid mistakes like **handel*, pupils should not listen to the sounds of these words, but rather learn the construction of these words instead (Van Berkel 52-54). The deep orthography, comprising the four different orthographic categories, of the English language is confusing for dyslexic pupils, as well as for non-dyslexic pupils when learning English as a second language. Furthermore, certain combinations of letters in English do not occur in Dutch, such as the combination of <ue>, whereas the combination of <eu> does exist in Dutch. This could lead to spelling errors such as **treu*. Additionally, knowledge regarding the written form of words is often missing or incomplete in dyslexic pupils because they have trouble retrieving this knowledge from their long term memory. When engaged in a writing task, dyslexics are therefore not able to check their own spelling because they lack the knowledge to do so (Van Berkel 42).

In addition, when learning English as a second language, pupils are expected to acquire new vocabulary. Pupils can acquire these new words through language input, that is when reading texts and listening to texts or to the teacher, but they mostly acquire new vocabulary when they are asked to learn word lists. These word lists are usually provided by the course book used in class. Various chapters, which are often thematically-organised, offer these word lists. The words in these lists thus all relate to the theme of the chapter. For example, if a chapter is about school, children will only come across words that relate to this

theme. This results in word lists containing words with various sounds and various spellings. Learning these word lists can therefore be extremely difficult for dyslexic pupils because they are constantly confronted with the inconsistent spelling system of the English language. Consequently, it could be difficult to link the spelling to the sounds of words, which could then lead to pupils not recognising words. Moreover, it takes dyslexic pupils much longer to learn a word list than non-dyslexic pupils, and in addition, dyslexics could experience difficulties in remembering the words as well (Van Berkel 35).

1.3 How secondary schools (could) deal with dyslexia

Het protocol Dyslexie Voortgezet Onderwijs was created in association with several schools and by order of the Ministry of Education, Cultural Affaris and Science. The protocol aims to provide a method which ensures a univocal and effective guidance of dyslexic pupils in secondary education (Henneman, Kleijnen, and Smits 3).

The protocol emphasises that teachers should provide a more general guidance besides the additional aids used in class for dyslexic pupils. This could be accomplished in various ways; first of all, teachers should support and enhance the self-image of dyslexic pupils: this motivates them and could also prevent fear of failure and test anxiety. In order to do this, teachers should try to help dyslexic pupils in accepting dyslexia as an obstacle. In addition, teachers should provide dyslexics with positive and constructive feedback, that is stating explicitly which errors they make, and how to improve on these errors. Secondly, during class, it is important for teachers to use clear instructional language. Additionally, it is useful to keep an eye on dyslexic pupils in order to anticipate some of the difficulties they experience and, overall, to supervise the pupils properly. Lastly, teachers should analyse the course materials and tests they use in class; for dyslexic pupils, it is important that lesson material is ordered, functional and univocal (Henneman, Kleijnen, and Smits 41-57).

Furthermore, the protocol provides a more specific set of guidelines on how to deal with the difficulties dyslexics could experience when learning a modern foreign language in secondary school. The protocol suggests various aids teachers could use in order to guide dyslexic pupils. Firstly, pronunciation and spelling are usually major stumbling blocks for dyslexic pupils. The protocol suggests to emphasise the spelling rules frequently and to visualise the spelling rules as well. For instance, by using images or tables during the instruction. Figure 2 below visualises the spelling rule (+ <s>) for the plural form (one bottle, two bottles) in the English language.

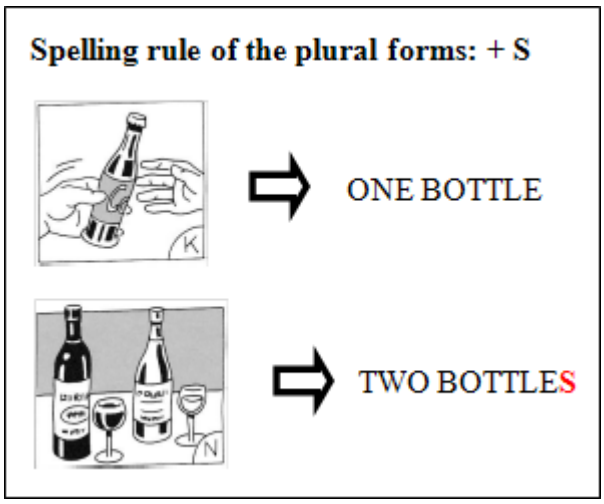

Figure 2: Spelling rule of the plural form, visualised (images: Dekker 24)

In addition, teachers should explicitly link the spelling of words to the sounds of words. Furthermore, acquiring new vocabulary is often regarded as one of the most difficult tasks for dyslexics. Learning new words through computer programmes could aid the process, but this is not always possible or preferred by dyslexic pupils. Learning new words in context could then be very useful as well. In addition, many dyslexic pupils experience difficulties during reading. The protocol recommends providing auditory aids during reading and, additionally, to give dyslexic pupils the opportunity to listen to a text instead of reading it, especially if the text is lengthy. Lastly, the protocol offers insights regarding how best to guide dyslexics

during test moments and how to mark tests. It is important that dyslexics have enough time during test moments because it takes them longer to retrieve knowledge from their long term memory. Moreover, it can take dyslexics longer to analyse and understand the exercises they are asked to do as well. Furthermore, taking tests orally could help dyslexics as well; they will listen to the exercises instead of reading them, and will avoid various difficulties they would have experienced when writing the answers down. When marking the tests of dyslexic pupils, teachers should be considerate of the many errors dyslexics make in their spelling. Solutions could be accepting the phonetic spelling of words or not to consider spelling errors as incorrect at all. (Henneman, Kleijnen, and Smits, 115-136). In extreme cases, dispensation of the modern foreign languages is a possibility as well. This, however, only occurs if a dyslexic pupil is not capable of taking part in the curriculum ("Ontheffingsmogelijkheden voor de talen bij dyslexie in het VO").

All in all, there is much more to guiding dyslexic pupils than merely the extra aids which are usually provided by secondary schools. Teachers should be aware of all the various difficulties dyslexics could experience and how to anticipate these difficulties. It is questionable, however, whether every secondary school and every teacher in the Netherlands is aware of the facts and of all the possibilities which are officially provided by the government.

1.4 This Study & Hypotheses

This study aims to investigate whether Dutch secondary school pupils in a first-year HAVO/VWO class (for more information on this type of education, see Chapter 2 below) are sensitive to the English spelling system or not. In addition, this study aims to investigate whether this sensitivity correlates with the reading- and spelling capacities of these pupils as well. In other words, of special interest is the question whether dyslexic and typically

developing (TD) pupils will perform differently on the various tasks used in this study, with the TD children outperforming the dyslexics. The tasks used in this research project consisted of four tasks that were administered in class for the whole group at the same time, and two tasks which were only administered for the dyslexic pupils in that class and a control group of TD pupils. The first two tasks of the four in-class tasks consisted of a Dutch dictation and a English dictation, in order to test the pupils' productive spelling capacities in both their native language (Dutch) and their non-native language (English). The last two in-class tasks comprised a Dutch spelling selection task and an English Spelling selection task, to test the pupils' receptive spelling capacities in both their L1 and L2. In order to test the pupils' reading capacities, as well as to more closely examine the difficulties dyslexic pupils experience during reading as opposed to TD pupils, both a Dutch and an English reading task were included in this study.

On the basis of the literature discussed above, the following hypotheses are formulated for this study:

- All pupils are expected to perform better on the Dutch dictation than on the English dictation regardless of the fact whether or not they are dyslexic. The rationale behind this is that Dutch is not only their native language, but also contains a much more opaque spelling system.
- Secondly, all pupils are expected to perform better on the Dutch spelling selection task than on the English spelling selection task, as Dutch is their L1.
- Thirdly, based on the fact that production is generally considered more difficult than perception (Bosman and Van Orden 10), all pupils are expected to perform better on the spelling selection tasks than on the dictation tasks.

- Furthermore, dyslexic pupils are expected to perform more poor on the two dictation tasks than the typically developing pupils, as dyslexic pupils are expected to encounter various difficulties during these tasks.
- The fifth prediction is that the typically developing pupils will obtain a higher score on the spelling selection tasks than the dyslexic pupils, because dyslexic pupils are expected to experience various difficulties during these tasks.
- In addition, the dyslexic pupils and the control group of TD pupils are expected to perform better during the Dutch reading task than during the English reading task, as their native language is Dutch.
- Lastly, dyslexic pupils are expected to underperform during the Dutch and English reading tasks compared to TD pupils. That is, TD pupils are expected to read faster and more accurately than dyslexic pupils during these tasks.

Chapter 2: Method

This chapter aims to describe the methodology of the current study. This chapter is divided into three sections; firstly, the subjects of this research project will be discussed, after which the materials used in this study, and the procedure will be discussed as well.

2.1 Subjects

The subjects were all native speakers of Dutch except for one female, who was originally from Sierra Leone. All participants were pupils at a Dutch secondary school called R.S.G. Pantarijn in Wageningen, an urban environment in the middle of the Netherlands. Furthermore, all participants were enrolled in the first year of HAVO/VWO education, which is one the higher levels of education in the Netherlands. The class consisted of 27 pupils, of which 3 diagnosed dyslexic pupils. Three pupils, however, had to be dropped from the research project; two due to illness and one because of a resit. This rendered to a total of 21 non-dyslexic pupils (15 female, 9 male) and three dyslexic pupils (2 female, 1 male) with a mean age of 12.3 years (range: 11-13).

As part of their regular coursework, the pupils received two English lessons of 70 minutes per lesson. During these classes, pupils were generally not required to speak English. In fact, they only spoke English during small dialogues, presentations, or when reading a text out loud in class. Furthermore, the teacher did not always speak English during class either. Nevertheless, the pupils often read English texts or listened to short English texts as part of their regular course books. The average grade of for English of this class was 7.2 (range: 4.2-8.5). Before administering the various tasks of the current study, permission of the class teacher was obtained. The pupils did thus not participate in this study voluntarily.

2.2 Materials

This research project consisted of four tasks that were administered in class for the whole group at the same time, and two tasks which were only administered for the three dyslexic pupils and a control group of three typically developing pupils. The three dyslexic pupils were examined more closely as a group, and to do this properly, a control group of three TD pupils was also selected randomly. The four in-class tasks comprised a Dutch dictation task, an English dictation task, a Dutch spelling selection task, and an English spelling selection task. The two individual tasks consisted of a Dutch e*en-minuut-test* (one-minute-test), and an English reading task. All stimuli are provided in appendix A-D.

2.2.1 Dutch dictation task

The Dutch dictation task (Vos & Van Veen-Roosendahl 2001) was used in this research project to test the pupils' Dutch spelling capacities, and, more specifically, to test whether there was a correlation between the spelling capacities of pupils in Dutch and English. Of special interest was the question whether the dyslexic and typically developing pupils performed differently on this task. The dictation consisted of 10 sentences, containing 64 real words in total. For this task, the number of errors was counted; each spelling error counted as one error, even within one word. In other words, a single word could contain multiple errors. Punctuation errors did not count as errors, but wrong use of capitals did. For instance, if a pupil wrote **english* instead of *English*, this counted as one error.

2.2.2 English dictation task

The English dictation task was created for the purpose of this study, and on the basis of the regular course materials of the pupils. The English dictation, like the Dutch dictation, was used to test the pupils' English spelling capacities and, more specifically, to test whether there

was a correlation between the spelling capacities of pupils in Dutch and English. Moreover, this task was also used to test whether dyslexic pupils and TD pupils obtained different scores on this task. The dictation contained 10 sentences, and the entire test comprised 84 real words in total. As for the Dutch dictation, the number of errors was counted for this task; each spelling error counted as one error, even within one word. Also similar to the Dutch dictation task, punctuation errors did not count as errors, but wrong use of capitals did.

2.2.3 Dutch spelling selection task

The Dutch spelling selection task (Horsley 2005) was used to test if pupils were able to select the correct Dutch spelling pattern when presented with three spelling options for the same word. This was especially interesting because in this way, the production and reception of spelling can be compared. Spotting errors in a given word is considered to be easier than correctly spelling a word oneself (Bosman and Van Orden 10). It is therefore expected that the scores on the spelling selection task will be higher than those on the dictation task. Furthermore, the task was used to investigate whether there was a difference between the results of TD pupils and dyslexic pupils. The task contained 39 real words, so the highest score that could be obtained by the pupils was 39. For each error, one point was deducted from the maximum score of 39.

2.2.4 English spelling selection task

The focus of this research project was on the English spelling selection task (Cassar and Treiman 1997). The goal of this task was to test whether pupils, at this age and this level of English, were sensitive to the English spelling system. Moreover, this task was also used to test whether there was a difference between the results of non-dyslexic pupils and dyslexic pupils. The stimuli consisted of 5 real word pairs and 34 pseudo word pairs. The English

spelling selection task, like the Dutch spelling selection task, contained 39 words, so the highest score that could be obtained was 39. For each error, one point was deducted from the maximum score of 39.

2.2.5 Dutch one-minute-test

The one-minute-test (OMT) is a Dutch timed reading task (Brus & Voeten 2008). A test taker has to read as many real Dutch words correctly in the time span of one minute. The test consisted of 116 words, increasing in difficulty. If a word was mispronounced by a pupil, one point was deducted from the total number of words read. So, if a pupil read 75 words in total, and mispronounced 5 words, the raw score was 70. A pupil mispronounced a word if (s)he pronounced *verdiepen (deepen)* instead of *verdieping (deepening)*, for example. This test was used in this study to test the pupils' reading capacities. Furthermore, this test was also used to examine whether dyslexic pupils experience more difficulties during reading than TD pupils.

2.2.6 English reading task

The English reading task (Van der Leij and Morfidi 2006) was used in this research project as an equivalent of the Dutch OMT. The task consisted of two reading cards, both containing 20 real English words, which did not increase in difficulty. A subject had to read all words correctly as quickly as possible. Each mispronounced word counted as one error. For instance, if a pupil pronounced the English word *bloke* as the Dutch word *blok*, one error was recorded. The goal of this test, like the Dutch OMT, was to test the pupils' reading capacities and to investigate the difficulties dyslexic pupils encounter during reading.

2.3 Procedure

The pupils were tested in two sessions. The first session contained the in-class tasks, and the second session consisted of the individual reading tasks. In both instances, the tests were administered during school hours and as part of the pupils' regular English instruction. In the first session, the order of tasks was as follows: the first task was the Dutch dictation, because this was expected to be an easy task to begin with, which was followed by the English dictation. After the two dictations, the spelling selection tasks were administered; first the Dutch spelling selection task and, lastly, the English spelling selection task. The tasks were administered in this order because reading the stimuli of the spelling selection tasks before the dictations could influence the pupils' spelling during the dictation tasks. Before each task, the pupils received clear instructions, and in between the tasks a small break of a few minutes was inserted in order to preserve the pupils' concentration.

2.3.1 Dutch dictation task and English dictation task

At the beginning of each dictation, pupils were informed that each sentence would be read as a whole, then in parts and lastly repeated as a whole again. There was ample time between the sentences to allow the pupils to spell the sentences at their own pace. After each sentence, the tester checked whether each pupil was finished or not. In total, each dictation took approximately 10 minutes.

Most pupils were not very amused when they heard they had to do two dictation tasks, which resulted in unmotivated pupils. During the completion of the task, all pupils were therefore rather bored, yet they were willing to cooperate as well.

2.3.2 Dutch spelling selection task and English spelling selection task

For the Dutch spelling selection task, pupils were informed that they would be presented with 39 real Dutch words with three different spellings, and that only one spelling was correct. Furthermore, they were instructed to circle the correctly spelled word for each item. Originally, 15 minutes were reserved for this task. The pupils, however, only needed approximately 5 minutes for this test.

For the English spelling selection task, pupils received the same instructions as for the Dutch equivalent, but as they would also be presented with pseudo words during this task, a few examples were explained in class to elucidate the task. At the outset, 25 minutes deemed necessary for this task, but the pupils completed this task within 10 minutes.

During the completion of these tasks, all pupils were very cooperative and relaxed; they experienced the spelling selection tasks as much easier than the dictation tasks, which made the tasks more fun for the pupils to do.

2.3.3 Dutch and English reading tasks

The Dutch OMT and the English reading task were administered as part of one-on-one sessions with three dyslexic pupils and three non-dyslexic pupils. All pupils were familiar with the Dutch OMT, so very few instructions were needed here. For the English reading task, the pupils were informed to read all the words presented on the reading card as accurately and as quickly as possible. These one-on-one sessions took approximately 5 minutes per subject. During the completion of these tasks, all pupils were very cooperative and relaxed, except for one dyslexic pupil, who seemed rather anxious to make errors during these tasks.

Chapter 3: Results

This chapter aims to expound the results of the various tasks that were involved in this study. The results will be discussed in the same order in which the tasks were administered: first the two dictation tasks; secondly, the two spelling selection tasks, and lastly, the reading tasks. An elaborate discussion of the results will follow in the next chapter.

3.1 Demographics for the participants

Table 1 below first of all presents some demographics for the participants: their average age, boy/girl ratio, and, most importantly, their overall grade for the school subjects English and Dutch. As will be the case for the rest of this chapter, the results are presented separately for the typically developing pupils versus the dyslexic pupils.

Table 1: Demographics of the Participants (split per group)

	Mean age	**Boy/girl ratio**	**Mean grade for English**	**Mean grade for Dutch**
Typically developing (n=21)	12,33 (.577) Range: 11-13	Boys: 8 Girls: 13	7,205 (1,01) Range: 4,2-8,5	7,514 (.08) Range: 6,0-9,8
Dyslexic (n=3)	12,00 (.000) Range: 12	Boys: 1 Girls: 2	7,030 (.64) Range: 6,3-7,5	7,633 (.643) Range: 7,3-8,0

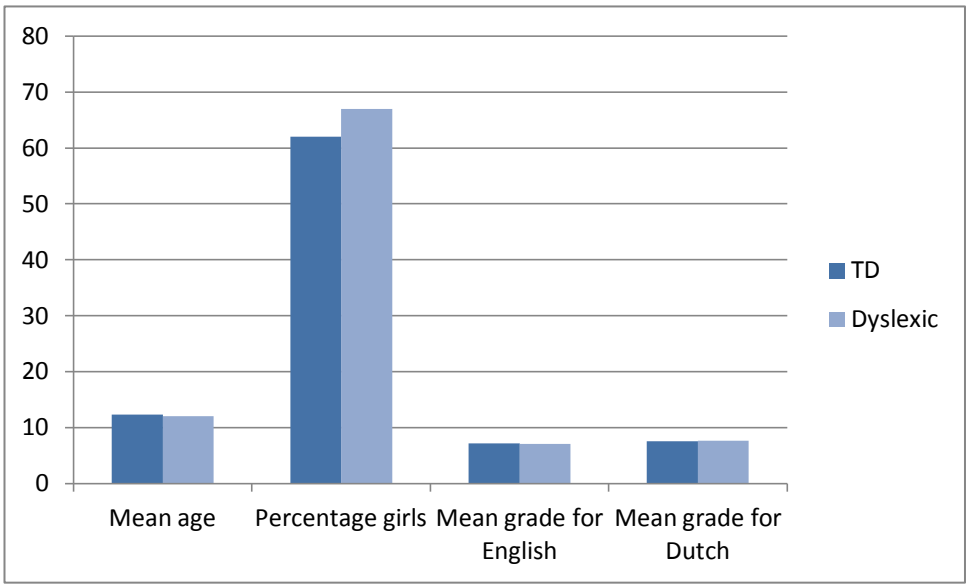

Figure 3: The participant demographics, visually presented

On the basis of these demographics, there was no difference between the TD and dyslexic pupils at the outset: all were about the same age, had a roughly similar boy/girl ratio, and did not differ significantly in the average grade for the school subjects English and Dutch.

3.2 Tests administered for the whole group

The tables below give the mean scores for the various tests which were administered for the whole group. Table 2 first of all presents the results on the Dutch and English productive dictation tasks, again split per group (dyslexic versus non-dyslexic). The two languages are presented in one table to be able to compare and contrast the scores for both languages. The scores listed indicate the number of errors produced for the test as a whole. Please be reminded that the dictation task for both languages consisted of 10 sentences and multiple spelling errors could be produced per word.

Table 2: Mean number of errors (and standard deviation) produced as part of the Dutch and English dictation task

	Dutch dictation task	**English dictation task**
Typically developing pupils (n=21)	11,14 (3,31) Range: 6-20	13,76 (5,57) Range: 7-26
Dyslexic pupils (n=3)	23,00 (3,00) Range: 20-26	29,33 (5,69) Range: 23-34

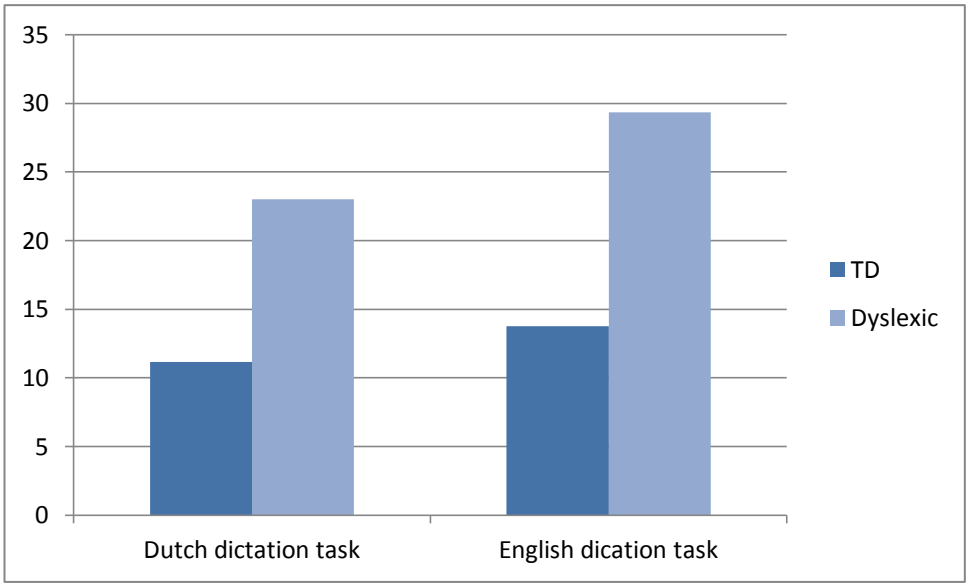

Figure 4: Mean number of errors for both groups on the Dutch and English dictation tasks

As can be seen, both groups did better on their native language dictation task as compared to the English equivalent, as was expected. In addition, the dyslexic pupils produced considerably more errors on both tasks when compared to their TD peers, again in the line of expectations. The difference between the number of errors on the Dutch and English dictation tasks proved significant for the typically developing group (as assessed on the basis of a paired samples t-test), $t(20) = -2{,}133$, $p <. 05$, but not for the dyslexic group ($p= .262$), which is most likely caused by a statistical power failure (there were only three pupils in the dyslexic condition). Moreover, the difference in scores between the TD and dyslexic pupils was

significant: the dyslexic pupils thus performed significantly poorer than their TD peer on both tests (as revealed by the means of independent samples t-tests):

English dictation: $t(22) = -4{,}390$, $p < .000$

Dutch dictation: $t(22) = -5{,}858$, $p < .000$

Table 3 below presents the mean scores (and standard deviations) for the Dutch and English spelling selection tasks, again split per group (dyslexic versus non-dyslexic). The two languages are presented in one table to be able to compare and contrast the scores for both languages.

Table 3: Mean number of errors for both groups on the Dutch and English spelling selection tasks

	Dutch spelling selection task (Max = 39)	**English spelling selection task* (Max = 39)**
Typically developing pupils (n = 21)	37,10 (1,58) Range: 34-39	38,05 (1,02) Range: 35-39
Dyslexic pupils (n = 3)	34,00 (1,73) Range: 33-36	38,67 (0,58) Range: 38-39

* Note: although there were three separate grammatical categories that were tested as part of the English spelling selection task, for the sake of this study – and also to make the scores more comparable to the Dutch equivalent – the categories have been merged.

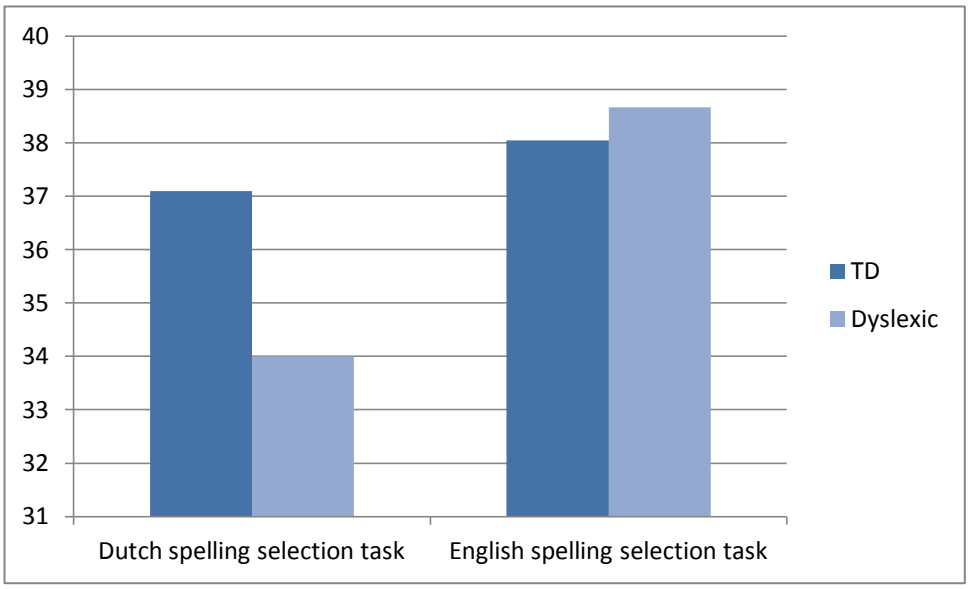

Figure 5: Mean scores on the Dutch and English spelling selection tasks

Examining the results on the Dutch and English spelling selection tasks, an interesting tendency emerges. A ceiling effect can first of all be seen across all groups for both the Dutch and the English task in that the pupils did surprisingly well on both. Curiously, their score for the English task (their L2) was higher than that of the Dutch task (their native tongue and the language with the less opaque spelling system). In fact, both TD pupils and the dyslexic pupils performed significantly better in English than in Dutch as measured by a paired samples t-test: $t(20) = -2{,}197$, $p < .05$ for the TD pupils and $t(2) = -5{,}292$, $p < .05$ for the dyslexics. The scores also show that the dyslexic pupils on average produced a similar score compared to the TD pupils on the English test (even slightly better), but scored markedly below the mean of the TD children on the Dutch spelling selection task. An independent samples t-test did not show this effect to be significant, and this is likely caused by a lack of power (see also previous test).

3.3 Tests Administered individually

The following analyses concern the tests that were administered individually for the three dyslexic pupils in the sample and three matched TD control participants. Table 4 presents the scores on the Dutch one-minute-test and the English reading task. It should be noted that the administration of these tasks was markedly different, and, as a result, so are their outcomes. As part of the Dutch OMT, pupils were presented with a list of Dutch words which they were asked to read out loud. The total number of words read within the time span of one minute was recorded. The raw score was calculated by subtracting the total number of errors (mispronunciations) from the total number of words named. This means that, in short, a larger raw score indicates a better performance. By contrast, there were two English read out loud tests, both of which contained 20 words. Pupils were asked to read all these words out loud and the number of seconds it took them to do so was recorded. Here too, mispronunciations were recorded, but rather than subtracted were added to the total number of seconds to result in the raw score. As opposed to the Dutch OMT, a larger score therefore indicated a poorer performance. The score reported in Table 4 below for the English task is the average of both test 1 and test 2. Because the results on both tasks are thus very hard to compare statistically, no statistical within groups comparison is presented here.

Table 4: Table 4: Mean raw scores (and standard deviations) on the Dutch and English reading tasks, split per group

	Dutch OMT	**English reading task**
Typically developing pupils (n = 3)	86,67 (11,68) Range: 74-97	14,33 (3,25) Range: 11-17,5
Dyslexic pupils (n = 3)	64,67 (5,86) Range: 58-69	25,00 (3,91) Range: 20,5 – 27,5

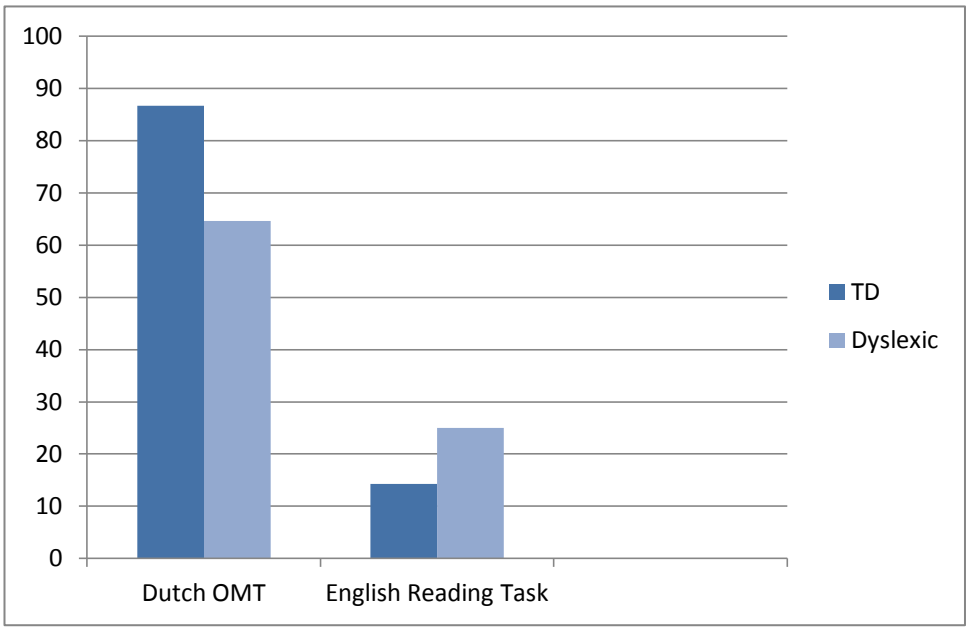

Figure 6: Raw scores on the Dutch and English reading tasks

A clear trend emerges from these scores: the typically developing pupils outperformed their dyslexic peers on both the Dutch and the English read-out loud paradigms, evidenced from their larger score on the Dutch test and smaller value on the English equivalent. Although the difference between both groups was not siginificant for the Dutch test, it was for the English test: $t(4) = 2{,}917$, $p < .05$. What is furthermore interesting to note is the larger standard deviation for the typically developing children on the Dutch test, which is absent for the dyslexics: there was more individual variation in scores for the TD pupils in their Dutch performance, which the dyslexic pupils did not show so much.

3.4 Main findings

In sum, typically developing pupils performed better than the dyslexic pupils on all tasks, except for the English spelling selection task. Furthermore, all pupils performed better on the Dutch tasks than on the English tasks, again, except for the spelling selection tasks. What is remarkable in these results is that the English spelling selection task did not seem to challenge

the pupils, whereas it was originally hypothesised that all pupils would indeed encounter difficulties during this tasks. Moreover, it is counterintuitive that the dyslexic pupils performed better on the English spelling selection task than their TD peers. In order to examine what might have caused the pupils to perform like this, both the results and the tasks must be discussed and analysed more elaborately.

Chapter 4: Discussion

The focus of this study was on the English spelling capacities and the English spelling pattern recognition abilities of Dutch secondary school pupils. Various tasks were administered in a first-year HAVO/VWO class during two test sessions. This chapter aims to further discuss the results of this study stated in the previous chapter. The results will be discussed on the basis of the hypotheses previously formulated for this study (see Chapter 1), and following the order of the task administration during the test sessions.

4.1 Dutch dictation task and English dictation task

Based on the fact that Dutch was the pupils' native language, all pupils were expected to perform better on the Dutch dictation task than on the English dictation task. Moreover, the Dutch language is known to have a more or less transparent orthography, whereas the English language has a deep orthography (Bekebrede et al. 755). This could also result in the pupils performing better on the Dutch dictation task than on the English equivalent. This hypothesis was confirmed by the results, as the findings showed that Dutch secondary school pupils indeed performed better on the Dutch dictation task than on the English dictation task. The second hypothesis considering the Dutch and the English dictation tasks stated that dyslexic pupils were expected to perform worse on the two dictation tasks than TD pupils, since dyslexic pupils are expected to encounter various difficulties during these tasks. This hypothesis was also confirmed by the results, as the difference in scores between the dyslexic pupils and TD pupils was significant. These findings can be explained by the fact that dyslexics usually experience these tasks as rather difficult. As Van Berkel argues, knowledge regarding the written form of words is often missing or incomplete in dyslexics because they have trouble retrieving this knowledge from their long term memory. Dyslexics are therefore not able to check their own spelling during a writing task, such as the dictation tasks, because

they lack the knowledge to do so (Van Berkel 42). Moreover, a dictation task is in principle a transcribing task, that is pupils were expected to spell words on the basis of auditory perception, which is a difficult task for dyslexics due to a deficit in the phonological component of language (Lyon, Shaywitz, and Shaywitz 7). Despite the fact that Dutch has a more transparent orthography than English, a dictation task remains difficult for dyslexics.

4.2 Dutch spelling selection task and English spelling selection task

As was the case for the Dutch and English dictation tasks, all pupils were expected to perform better on the Dutch Spelling selection task than on the English equivalent because Dutch was their native language. Furthermore, all pupils were also expected to perform better on the Dutch spelling selection task because Dutch has a more transparent orthography than English. Nevertheless, this hypothesis was not borne out of the data. Remarkably, the pupils' score for the English task was significantly higher than that of the Dutch task. It could be argued that these remarkable findings are due to a difference in difficulty between the Dutch and the English spelling selection task. The items on the English task appear to be much easier than on the Dutch task in the sense that the words with the incorrect spelling pattern are less of a realistic alternative option in the English task. For instance, in the English task, pupils could choose between *hops* and *hropfrs*. This exercise does not truly challenge the pupils, whereas in the Dutch spelling selection task, the pupils were challenged to a much greater extent. For example, in the Dutch task, the pupils were asked to choose between items such as *kniën, knieën,* and *kniëen.* The choice given in this example seems much harder than the choice the pupils were offered in the English example.

Furthermore, typically developing pupils were expected to obtain a higher score on the spelling selection tasks than the dyslexic pupils because dyslexics are likely to experience more difficulties during these tasks than TD pupils. For the English spelling selection task,

this hypothesis was falsified, as the results show that the dyslexic pupils one average produced a similar score compared to the TD pupils. In fact, the dyslexics performed even slightly better on this task. This can be explained on the grounds that, as mentioned before, the pupils were presented with rather straightforward choices during this task. In addition, this is likely to be caused by a statistical power failure as well, considering that there were only three pupils in the dyslexic selection. For the Dutch spelling selection task, however, the hypothesis was confirmed. The dyslexic pupils scored markedly below the mean of the TD pupils on this task. This difference was, however, not significant. It could well be that the hypothesis was indeed confirmed for the Dutch spelling selection task (and not for the English equivalent) because this task was more challenging for the pupils, and moreover, a more realistic test.

Lastly, all pupils were expected to produce better scores on the spelling selection tasks than on the dictation tasks because spelling recognition is predicted to surpass spelling production: "Recognising the correct spelling is easier than producing it" (Bosman and Van Orden 10). This hypothesis was confirmed, as all pupils obtained higher scores on the spelling selection tasks than on the dictation tasks.

4.3 Dutch OMT and English reading task

As with all the previous tasks, the three dyslexic pupils and the control group of three TD pupils were expected to perform better during the Dutch reading task than during the English reading task, since their native language is Dutch. Because Dutch was the pupils' L1, they are able to recognise the words faster as they are reading them out loud. Additionally, Dutch has a more transparent orthography than English, which leads to pupils recognising the words faster as well (Van Berkel 35). As mentioned before (see Chapter 3), it was very hard to compare the Dutch and the English reading tasks considering the difference in administration between

these tasks. It is therefore hard to state whether this hypothesis is confirmed or not. Nevertheless, during the sessions, all pupils seemed to have more trouble during the English reading task than during the Dutch reading task. They often showed higher insecurity levels regarding the English words before pronouncing them out loud than about the Dutch words. This could well be because they did not know all the English words presented, whereas they were more familiar with the Dutch words and the constructions of these words.

Furthermore, the dyslexic pupils were expected to perform more poorly on both the Dutch and the English reading tasks than the TD pupils. In other words, TD pupils were expected to read faster and/or more accurately than dyslexic pupils during these tasks, as dyslexic pupils are predicted to experience more difficulties during reading (Henneman, Kleijnen, and Smits 11 and Van Berkel 34). Based on the results, this hypothesis was confirmed in the sense that TD pupils read faster and made fewer errors than the dyslexic pupils.

It is finally important to state that the subjects of this study came from a first-year HAVO/VWO class, which is one of the higher levels of education in the Netherlands. *Het Protocol Dyslexie Voortgezet Onderwijs* provides standards, varying per level of education, to recognise possible dyslexic pupils. For instance, a VMBO-TL (lower educational level) pupil could be dyslexic if (s)he produces at least 18 errors during a dictation task, whereas a VWO (higher educational level) pupil could be dyslexic if (s)he produces at least 15 errors during a dictation task. This indicates that the problems dyslexics usually experience could increase in pupils from the lower educational levels (Henneman, Kleijnen, and Smits, 4).

4.4 Implications for the Teaching Practice

The results of this study could have important implications for the English foreign language classroom with regard to both dyslexic and the TD pupils. The results reveal that all pupils encounter difficulties when they have to produce the correct English spelling during the dictation task. Dutch secondary school pupils are likely to benefit most from extensive explanations regarding the English spelling system. However, Dutch pupils are not provided with proper spelling rules, except when it concerns a grammatical subject, such as a rule that denotes the difference between the English plural forms of boy-boys and body-bodies. In principle, the spelling of words containing a basic orthography, rule orthography, and construction orthography can be acquired through spelling rules. Words containing an imprint orthography, however, do need to be learned by heart because of the inconsistent phoneme-grapheme correspondences, although there are some mnemonic aids to help pupils spell those words correctly as well. For instance, the /eɪ/ sound is often spelled with the letters <ai> when it occurs before the consonants <l> and <n>, as in *e-mail* and *train* (Van Berkel 52-54). Furthermore, understanding the English spelling system can also be stimulated and facilitated by teaching pupils phonological awareness and linking the phonology to orthography. This could help pupils to discriminate between the ambiguous sounds and words within the English language (Snowling, Hulme, and Nation 90). This can be accomplished by incorporating a so-called sound-spelling script into the regular course materials (Van Berkel 107). A sound-spelling script contains keywords (*"kapstokwoorden")* resembling a certain sound. Under these keywords, other words with the same sounds can be written down, divided into four categories, namely, the four orthographies. Figure 1 below shows a page from a sound-spelling script for the sound /eɪ/.

Basic orthography	Rule orthography	Rule orthography	Imprint orthography
a in *baby*	**a – e** in *cake*	**ay** in *play*	**ai** in *e-mail*
Bacon Potato Lady Paper Table Station	Face Name Age Place Make Take	Day Birthday Today Yesterday	Rain Train

Figure 7: example sound-spelling script for the sound /eɪ/ (Van Berkel 108).

Teaching pupils the connection between phonology and orthography could be beneficial to all pupils, regardless of whether they are TD or not because they are used to Dutch, a language with a transparent orthography, whereas English is a language containing a deep orthography. However, incorporating a sound-spelling script into the regular course materials could well be time-consuming. Besides the fact that teachers are already expected to teach too much for the time they are allotted, this is also a very intensive task for the dyslexic pupils. They already tend to spend more time on their school work than TD pupils, so a sound-spelling script can be very time-consuming and exhausting to them, which could eventually discourage them. It remains beneficial to all pupils, however, to spend more time explaining the spelling system and the spelling rules during the English lesson and the ideal way of achieving this deserves more attention in the future.

Conclusion

The results of this study have shown that typically developing pupils generally outperform their dyslexic peers. First of all, during the Dutch and the English dictation tasks, the TD pupils made significantly fewer spelling errors than the dyslexic pupils. Furthermore, TD pupils outperformed the dyslexics on the Dutch spelling selection task as well. Remarkably, TD pupils did not perform better than the dyslexic pupils on the English spelling selection task, but it remains true that all pupils performed surprisingly high on this task. Lastly, the TD pupils read faster and made fewer errors than the dyslexic pupils during both the Dutch and the English reading tasks as well. In addition, all pupils performed better on the Dutch tasks than on the English tasks, except for the spelling selection tasks. The results of this study underscore the expected difficulties dyslexic pupils could encounter during spelling and reading tasks.

Nevertheless, the results of this study must be interpreted cautiously, as this study was limited in some aspects. First of all, this was a small-scale study: only one class was investigated and there were only three dyslexic pupils, which ultimately resulted in a statistical power failure. Furthermore, the English spelling selection task was incorporated in this study in order to test whether the pupils were sensitive to the English spelling system or not. However, this test did not seem to challenge the pupils, as they made very few errors. The English spelling selection task was therefore not truly relevant and valid to this study. Consequently, an answer to the question whether these pupils were sensitive to the English spelling system cannot be drawn from the results of this task.

Future research could first of all make use of a more challenging English spelling selection task in order to truly test the pupils' sensitivity to the English spelling system. The items with the incorrect spelling pattern should then be more of a realistic alternative option in this task. For instance, an alternative to *hops* could be *hopps*, rather than *hropfrs*.

Furthermore, the tests included in this study have already shown significant differences between typically developing pupils and dyslexic pupils. It would therefore be interesting to investigate a larger target group, and in particular, a larger group of dyslexics in future research in order to assess whether or not these significant differences between TD pupils and dyslexics will persevere in a large-scale study. It would finally also be interesting to test pupils from the lower educational levels in order to investigate whether the problems dyslexics usually encounter increase here or not.

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Appendices

Appendix A: Dutch and English dictation tasks

DLE Dictee

1. De patiënt wil ‘savonds pertinent citroenthee.
2. De kwaliteit van auto’s is fantastisch verbeterd.
3. Op de menukaart prijken chocoladepudding en yoghurt.
4. De verbrede dorpsstraat is absoluut ideaal.
5. De populaire keeper werd onmiddellijk uit het team verwijderd.
6. De ijzeren kandelaar is verroest.
7. Hij verbeeldt zijn fantasieën in schilderijen.
8. Dit heeft voor het ontvangstcomité vervelende consequenties.
9. Baldadigheid en vandalisme zijn destructieve eigenschappen.
10. De meisjesstemmen neuriën reuzeleuk.

English Dictation

1. My mother often drinks lemon tea during summer.
2. The price of the new car is fair.
3. John played in the garden with his dog.
4. I have to pay my rent every month.
5. Yesterday, I saw seven ducks swimming in the lake.
6. I could really use another clean towel.
7. My English teacher had a fever last week.
8. I was very nervous for the test.
9. Put the homework on my desk quickly, please.
10. Tom was late for dinner, as usual.

Appendix B: Dutch and English spelling selection tasks

Spellingskeuzetaak

Vul hier je naam

in:……

Vul hier je geboortedatum in:

…….

Vul hier de datum van vandaag in:

…….

Hieronder staan bestaande Nederlandse woorden.
Er staan elke keer drie varianten. De bedoeling is dat je het woord omcirkeld dat op de goede manier is geschreven.

Als er bijvoorbeeld staat:

voed	voet	foed

Welke spelling is dan correct?
Het antwoord is *voet*.

En welke is het voor de volgende reeks?

swart	zward	zwart

Op de volgende bladzijde staan nog 39 van die reeksen. Omcirkel voor elke rij van woorden het woord dat goed is gespeld.

Bedankt!

1	vruit	fruit	fruid
2	schaads	sgaats	schaats
3	schelp	schelup	sgelp
4	draai	draaj	draaij
5	bochd	bogt	bocht
6	verkeer	vekeer	verkir
7	sneuw	sneew	sneeuw
8	irste	eerste	eerstu
9	zagte	zachte	sachte
10	reusen	ruezen	reuzen
11	glasen	glaazen	glazen
12	grappeg	grappig	grapig
13	beloning	belooning	bloning
14	mogenlijk	mogelijk	mogelik
15	middulen	midelen	middelen
16	waarheit	waarhijd	waarheid
17	horologe	horloosje	horloge
18	fantastisch	fantasties	fatastisch
19	majestijt	majesteid	majesteit
20	vakansie	vakantie	vakantsie
21	operatie	operasie	operaatie
22	sjeuffeur	chauffeur	chaufeur
23	cirkel	sirkel	cirekel
24	belachlijk	belachelijk	belaggelijk
25	januawari	januari	januarie
26	eksplosie	explozie	explosie
27	situatie	sietuatie	situasie
28	ligamelijk	lichaamelijk	lichamelijk
29	luciver	lusifer	lucifer
30	joernalist	journalist	journaalist
31	parachute	parasjute	parrachute
32	arrestaatie	arrestatie	arestatie
33	Brazilië	Brazilie	Brazielië
34	kniën	knieën	kniëen
35	puneze	puunaise	punaise
36	specialist	speciaalist	spesjalist
37	milietairen	millitairen	militairen
38	agresieve	agressieve	agressiefe
39	tiepiste	tijpiste	typiste

Hi, I´m Harry from One Direction.

Could you please tell me which word is spelled correctly? Please circle the right word.

cat	kat

The answer should be *cat.*

Now we´ll do the same for nonsense words; words that don´t exist, but could be real words. Can you also tell me which of these nonsense words is spelled correctly?

nrstk	nookst

The answer should be *nookst*. You might not know the rules for the spelling, but trust your instinct for the selection.

On the next page, 39 pairs are presented. Please circle the correctly spelled (nonsense)word every time.

Thank you!

Your name: ……..

	Select one of each pair	
1	trie	tree
2	baff	bbaf
3	noss	novv
4	yatuff	yyatuf
5	zopink	zpnk
6	yyil	yill
7	dajj	dapp
8	siff	ssif
9	wosill	wwosil
10	snake	znake
11	ggefos	gefoss
12	naff	nakk
13	vvinal	vinall
14	foll	ffol
15	pen	paen
16	llopif	lopiff
17	hhol	holl
18	viss	viww
19	gaww	gatt
20	kaffort	kfrt
21	damiff	ddamif
22	jjubef	jubeff
23	cepp	cejj

	Select one of each pair	
24	tunoss	ttunos
25	maus	mouse
26	tehh	teff
27	nuss	nnus
28	jjus	juss
29	weff	wwef
30	hops	hropgrs
31	ddes	dess
32	vvaf	vaff
33	jull	jukk
34	sohh	soll
35	book	boek
36	ssidal	sidall
37	heniss	hhenis
38	devv	dett
39	grnhy	granpy

Appendix C: Dutch one-minute-test

waar	zijpad	priemen	struikgewas
kar	inham	getik	speelvergunning
been	stoutheid	oertijd	hernieuwen
min	proefstuk	aanplanten	berging
vos	lapje	slopen	nanacht
net	doch	vooruitduwen	uitspuwen
bruin	vegen	steigeren	herplaatsing
hand	koplamp	opsparen	onnozel
morgen	koelte	handelaar	medelid
eten	rekenen	diamant	zijrivier
mak	verdieping	bezig	vermindering
voorbij	geknoei	hanger	reling
hamer	genieten	puree	getuigschrift
zieke	paffen	achting	herkenning
luilak	warenhuis	opspuiten	overloodsen
trekken	aanzitten	plaatsnemen	bijeenkomst
verlaten	stelen	navliegen	tekortkoming
verhuizen	treurig	messteek	gelaatskleur
worden	voorstaan	ontschieten	beoefenaar
dichten	overlaten	scheepgaan	welsprekend
uithuilen	afwissen	boerenwoning	verslagenheid
kruid	groeve	begaafd	ontraadselen
grootmoeder	verdwijnen	pijlsnel	omslachtig
roeping	dichtwerpen	schouwing	tijdsbepaling
laan	hozen	schoenveter	ontworstelen
kruimel	zorgvol	kibbelen	saluutschot
heenlopen	spiegelen	schede	wetsrol
fietsbel	stamtafel	rotsvast	oneffen
schroeven	houtvlot	frommelen	rubberaanplanting

Appendix D: English reading task

Leeskaart 1	Leeskaart 2
1. desk	1. tower
2. sort	2. lemon
3. fork	3. garden
4. life	4. magic
5. sale	5. dinner
6. price	6. pencil
7. sand	7. seven
8. plate	8. labor
9. hole	9. hammer
10. sink	10. matter
11. wife	11. river
12. work	12. tiger
13. rent	13. harbor
14. left	14. fever
15. self	15. summer
16. bloke	16. ruler
17. wage	17. person
18. size	18. number
19. lake	19. towel
20. salt	20. supper