Tutkimuksen tavoitteena oli selvittää mitä dysleksia on, mikä sen aiheuttaa ja kuinka se vaikuttaa lukemiseen, kirjoittamiseen ja oppimiseen yleisellä tasolla. Erityisesti tutkimuksessa selvitettiin miten dysleksia vaikuttaa vieraan kielen oppimiseen ja sen eri osa-alueisiin, kuten esimerkiksi ääntämiseen, kieliopin oppimiseen tai sanastoon, sekä sitä, mitkä englannin rakenteet ja kirjallisen tuottamisen osa-alueet ovat erityisen vaikeita suomalaisille lukivaikeuksisille, jotka opiskelevat englantia vieraana kielenä.


Tutkimuksessa ilmeni, että vaikka aineiden kirjoittajien lukivaikeudena aste vaihteli lievästä erittäin vaikeaan dysleksiaan, virheiden määrä eri kategorioissa oli yllättävän tasainen. Eniten virheitä olivat suomen kielen vaikutteita, virheitä sekä yleisesti vieraaiden rakenteiden ja sanojen kanssa työskentelyä. Eniten virheitä aiheutti, että kirjoittajat unohtivat käyttää rakenteita, joita suomen kielellä ei esiinny. Lauseet olivat myös usein muodostettuja englannin rakenteita ja kirjoittajat muodostivat uusia sanoja suomen yhdyskokoja perusteella. Ääntäminen vaikutti erityisesti sanojen äänitentäkkeet ja sanojen kirjoituukseen. Sanat olivat usein kirjoitettuja nauhoittuina ja heikosti äänityssä kirjaimia ja pääteitä jätä sanoista kokonaan pois. Lukivaikeuksisilla näytti olevan myös erityisen vaikeata käsitellä yhtä aikaa vieraat sanat, rakenteita sekä sanajärjestystä, ja samalla ilmaista lauseissa haluamansa asiat ja ideat.

Tutkimuksen perusteella voikin sanoa, että lukivaikeuksisten englannin opetuksessa tulisi kiinnittää erityistä huomiota suomen ja englannin kielen yhtäläisyyskiinni ja eroihin sekä eri rakenteiden käyttöön ja merkitykseen. Tärkeää olisi myös huomioida, että englannissa sanat kirjoitetaan ja äännetään eri tavalla ja siksi eri ääntenääntämistä ja kirjoittamista tulisi harjoittaa paljon.
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1. Introduction

Dyslexia is a specific language based disorder that has been studied for well over a hundred years but still the researchers debate how to define the it, what causes it and more importantly how to help the people who suffer from the disorder. The disorder does not only cause difficulties in learning to read and write but it also affects a person's ability to operate with language and with linguistic material in general. Because of this dyslexics do not only have difficulties in operating with their mother tongue but also in learning a foreign language. Sometimes the disorder may not even manifest itself until the child starts to learn a foreign language. Recently research on dyslexia has progressed considerably due to new technological innovations that have offered the scientists new views on the possible causes behind the disorder as well as enabled them to understand better how the brain of the dyslexics actually work. These advances then offer new views on how to help the dyslexics to overcome their difficulties, for example at schools.

It has been estimated that in a broad sense 10-15 % of people in each age group in Finland suffer from the disorder (Lukityöryhmä 1999, 13), so it is not a question of a small minority whose difficulties can be overlooked at school but their difficulties and special requirements should be taken into account not only in Finnish lessons but also in foreign language lessons. The goal of this pro gradu thesis is to find out what dyslexia is, how it affects reading, writing and learning in general, what causes it, how it affects foreign language learning and which structures or areas of producing written texts in English as a foreign language (EFL) cause the most difficulties for Finnish students with dyslexia.

This thesis consists of two parts: of a theoretical part and of an empirical study. In the second chapter of the theoretical part I will discuss the definition dyslexia, why defining this disorder has been so difficult, how the definition has been developed through time and which definition this thesis follows and why. In the third chapter I will concentrate on the history of the disorder in order to find out how the concept of dyslexia as well as research on
the disorder has changed and developed through time and why. In the fourth chapter I will discuss the different factors that at this moment can be seen as the possible causes behind the disorder and in the fifth chapter I will briefly introduce a couple of classifications of dyslexia that have been created over time which further on shed some light on how versatile a disorder dyslexia really can be. The sixth chapter concentrates on the problems caused by dyslexia, i.e. how the disorder manifests itself in every day life and how it affects especially reading and writing. Besides these general problems this chapter has a special focus on how the disorder affects the different areas of foreign language learning, such as grammar, listening comprehension and reading and writing. In the seventh chapter I will introduce three earlier pro gradu theses on dyslexia and EFL. This chapter focuses on introducing their main research questions, research methods and more importantly their results. I will then later compare them to the results of my study (chapters 8 and 9) and discuss these findings in the conclusion chapter (chapter 10).

The material used in the first part of the thesis is mostly literature from the areas of special education, linguistics and neuropsychology, both in English and in Finnish. I have chosen some principle works which introduce the disorder and its effect on reading, writing and learning quite thoroughly but in addition I have chosen articles and studies which concentrate more on specific aspects of the disorder in order to understand better, for example the reasons behind dyslexia, the aetiology of the disorder, and how these causes affect especially Finnish foreign language learners. I have chosen works that are quite current because new research techniques have brought a lot of new information on the disorder.

The second part of this thesis is an empirical study where I will examine more deeply which structures of English or areas of producing written texts in EFL cause the most difficulties for Finnish pupils with dyslexia. The material of the study consists of 40 compositions written by ten Finnish senior secondary school students and one vocational school student who suffer from different degrees of dyslexia.
2. The concept of dyslexia

Even though dyslexia (lat. dys='difficulty with'/bad, lexis=word) has been the interest of many different disciplines, such as psychology, education, optometry and neurology, for over a hundred years, the researchers still, despite many efforts, have not been able to form an official definition for it (Lyon and Moats 1993, 4; Wengelin 2002, 24). Some researchers have even raised the question of why it should be defined or even whether it should be defined at all (Wengelin 2002, 25).

The first problem in defining dyslexia is that the researchers have not been able to reach an agreement on how to call the disorder. The original terms 'word-blindness' (Critchley 1975, 11) and 'strephosymbolia' (Critchley 1975, 11) are not used anymore but instead terms like 'unexpected reading and writing difficulty', 'specific reading retardation', 'reading difficulty' (Wengelin 2002, 24), 'specific learning disability' (Korhonen 2002, 127), the German term 'Legastenie' and 'dyslexia' (Wengelin 2002, 24) are used to describe more or less the same phenomenon. All of these terms were created in order to differentiate this specific learning disability which appears unexpectedly from general learning disabilities which are caused by brain damage or other handicapping conditions (Wengelin 2002, 28). In my thesis I will, for clarity, use the term 'dyslexia' also when the researchers and authors have used another term.

Defining dyslexia has proved to be a very difficult task because so many different disciplines with many different points of view have tried to examine the problem and create definitions to suit their own purposes, and also because dyslexics are a very heterogeneous group and a definition that would include them all but that would not be too broad and would be satisfactory for many different disciplines has proved to be too big of a challenge so far. One obstacle in reaching a common definition of dyslexia has been that different disciplines view the problem from very different angles. Some base their definition on etiological factors and try to define the difficulty through its cause, while others look at the problem from the
The versatility of the disorder, like mentioned before, has also caused difficulties in defining it. Moilanen (2002, 11) mentions that some researchers consider that dyslexia is only a difficulty of the phonological processing, while others think that it is rather a general term for a larger group of learning difficulties. He himself uses the term dyslexia in a very broad sense and includes to his definition not only the difficulties in learning to read and write which are linked to phonological processing and so to the problems of the auditory channel as well, but also the possible difficulties in perception and motor coordination. In my thesis I will follow the definition of the Orton Dyslexia Society according to which dyslexia is

... one of several distinct learning disabilities. It is a specific language-based disorder of constitutional origin characterised by difficulties in single word decoding, usually reflecting insufficient phonological processing abilities. These difficulties in single word decoding are often unexpected in relation to age and other cognitive and academic abilities; they are not the result of generalised developmental disability or sensory impairment. Dyslexia is manifested by variable difficulty with different forms of language, often including, in addition to problems in reading, a conspicuous problem with acquiring proficiency in writing and spelling. (Wengelin 2002, 26-27)

This definition is quite a broad one but it captures very well the characteristics that many different definitions of today have in common, i.e. the facts that the problems in learning to read and write appear unexpectedly, despite normal education and relatively good intelligence and that the disorder is not caused by brain damage or any other handicapping condition but that the problem is mostly connected to difficulties in phonological processing (Korhonen 2002, 127).
3. Historical review on the research on dyslexia

According to Javier Gayán Guardiola (2001, 5) the first description of a person with lost reading ability dates back to the 1670s but the phenomenon became more of interest mainly in the late 19th century. These early studies, however, concentrated on adult aphasiacs or mentally retarded patients with reading difficulties (Gayán Guardiola 2001, 5-6). The term 'dyslexia' was first used by a German doctor R. Berlin in 1872 but he, too, used it to describe an adult with acquired dyslexia, i.e. loss of reading ability due to a brain lesion (Gayán Guardiola 2001,6). In 1878 doctor A. Kussmaul also studied patients who had difficulties in understanding written language and using words in right places, and introduced the terms 'word deafness' and 'word blindness', which later became very popular and were used to describe dyslexics as well (Miles and Miles 1999, 5).

Dyslexia as a learning difficulty which is not caused by an injury was first discovered "simultaneously, yet independently", by two British doctors in 1896 (Critchley 1975, 9). Both Dr. James Kerr in Bradford and Dr. Pringle Morgan in Seaford started to examine why children whose intelligence was of a normal level had sometimes considerable difficulties in learning to read and write (Critchley 1975, 9). Morgan wondered if there "exists a condition which one might call 'congenital word-blindness'?" (Critchley 1975, 9). He suggested, according to Miles and Miles (1999, 4) that the problem was caused by difficulties in "preserving and storing up the visual impression produced by words", which he thought was caused by a developmental disorder in the left hemisphere (Korhonen 1995, 19). After Morgan and Kerr's reports the interest towards dyslexia rose remarkably and "the term 'congenital word-blindness' became very well established in the corpus of neurology" as Critchley (1975, 11) points out.

One of the first notable researchers of the early days is ophthalmologist James Hinselwood, who started to move the focus of the study of dyslexia from the description of the cases into the analysis and discussion of the disorder (Gayán Guardiola, 9). He developed,
for example, in the 1910s the theory of the defective development of the cerebration and its connection to the visual memorization of words, letters and shapes (Poussu-Olli 1993, 25-26). He thought that the cause of the disorder was damage to a 'visual word-centre' in the brain (Miles and Miles 1999, 5). Hinselwood was also one of the first to note that the disorder "could sometimes be hereditary... more common in boys than in girls" and that "it was a pathological condition" (Miles and Miles 1999, 5).

Another very influential researcher of dyslexia is doctor Samuel Torrey Orton who developed further the concept of developmental dyslexia or, using his own term, 'strephosymbolia' (twisting of symbols), which he created after noticing that many of the children he studied had a "tendency to distorted order in the recall of letters shown in the attempts ...to read a word or spell it" (Miles and Miles 1999, 8). Orton developed in 1937 a theory according to which difficulties in learning to read and write were caused by a delay of the development "due to a brain malfunction in the cerebral hemisphere dominance of one occipital lobe over the other" (Gayán Guardiola 2001, 10). He suggested that letters and words were restored in the dominant hemisphere the right way up and in the non-dominant hemisphere as their mirror images (Korhonen 1995, 163). The unclear dominance of the two hemispheres would then cause difficulties in reading as the mirror images of the non-dominant hemisphere would disturb the normal way of perceiving the letters and words by causing them to, for example, rotate and change places (Korhonen 1995, 163).

Gayán Guardiola (2001, 11) also points out, that "until the time of Orton dyslexia was an almost exclusive field for physicians, especially ophthalmologists and neurologists" which also caused the researchers to think that the disorder was mainly visual in character (Miles and Miles 1999, 11) "[but] after Orton, the study of dyslexia was shared also by psychologists, sociologists and educators". This changed also the way in which researchers treated the disorder. For years, researchers thought that dyslexics were a homogeneous group and that the disorder was caused by one, single, mainly neurological, dysfunction but as so
many other disciplines started to examine the disorder as well studies started to show that
there were in fact many different types of dyslexia with different kinds of problems and also
with different etiologies (Korhonen 2002, 138). Sociologists and educators also started to
study the environmental factors that could have an effect on dyslexia and psychiatrists looked
into the psychiatric consequences of dyslexia (Gayan Guardiola 2001, 11, 13).

In the 1970s new disciplines, like neuroanatomy, neuroscience and cognitive
psychology, brought new views to the study of dyslexia (Gayán Guardiola 2001, 16). It was,
for example, discovered that dyslexics often have memory problems, difficulties in naming
and that the disorder is related to phoneme awareness and the difficulties are mainly caused
by “the misuse of phonological structure and segmentation (Gayán Guardiola 2001, 16-17)
The connection between the asymmetry of the temporal plane and dyslexia was also
discovered thanks to the new technology (Gayan Guardiola 2001, 15). After the 1970s the
focus of the theories moved from visual to linguistic explanations of the problem but since
neuroanatomical and neurobiological studies revealed abnormalities in the brain of dyslexics
the visual theories became an interest of study again (Gayán Guardiola, 2001, 19;22).
4. Causes behind dyslexia

Dyslexia is a very versatile disorder and studies suggest that there exist many different types of dyslexia and thus there are also different theories on what causes the disorder. The ultimate cause of the disorder can hardly ever be found, as Ahvenainen and Holopainen (1999, 63) point out but the most recent theories on the causes of dyslexia suggest that the different kind of disorders are caused by genetic or environmental factors which make the function or the structure of the central nervous system defective (Ahvenainen and Holopainen 1999, 63). Next I will present some theories on the causes of dyslexia, first the genetic factors, then the neurobiological defects and finally the cognitive defects that may cause dyslexia.

4.1 Genetic factors

Researchers suggested already at the beginning of the 20th century that dyslexia is a hereditary disorder because many members of one family usually seemed to have it (Miles and Miles 1999, 89). The idea of dyslexia transmitting via genes is thus not a new one, but the possibility that social and environmental factors could also be the cause of the disorder could not be ruled out reliably at that time (Miles and Miles 1999, 89). The first to study the possible genetic origin of dyslexia in the 1950’s was Bertil Hallgren. According to Miles and Miles “his conclusion was that the transmission took place via a dominant gene that was autosomal” (1999, 91). Later this could not, however, be entirely proved (Miles and Miles 1999, 92).

New technology has brought new light on the matter and recent studies suggest that one of the main causes of at least some dyslexias is a genetic one, as many of them truly seem to be hereditary and because there is also strong evidence that at least chromosomes 1, 2, 3, 6, 15 and 18 are related to the disorder (Korhonen 2002, 140, Wolff 2005, 39). Studies do, however, show that a certain genetic factor does not necessarily predict a certain type of dyslexia but the disorder is rather the result of many different genetic and environmental
factors (Korhonen 2002, 140). Galaburda (2005, 161), for example, suggests that “developmental dyslexia can begin sporadically as the result of an alteration in brain development, but in most cases, it arises from a genetic mutation that runs in families… multiple developmental steps must take place before this risk translates into the clinical syndrome we call dyslexia”. Dyslexia is thus apparently often caused by a genetic factor or factors that affect the development and functioning of different parts of the brain (Galaburda 2005, 161). How these mutations affect the brain and change its functioning will be dealt more in detail in the next chapters.

4.2 Neurobiological defects

Researchers thought already at the beginning of the 20th century that dyslexia could be caused by some abnormalities in the brain functions of the dyslexics but it has not been until recently that new technological innovations have really shed some light on how the dyslexic brain actually works. In this chapter I will introduce the possible neurobiological causes behind dyslexia.

4.2.1 Defects of the visual processing and magnocellular deficit hypothesis

Majority of the researchers in the early 20th century thought that dyslexia was mainly a visual disorder (Gayán Guardiola 2001, 7). Orton, for example, suggested in the 1930s that the cause of dyslexia might be the unclear dominance of the two hemispheres, which disturbs the restoration of visual memories (Poussu-Olli 1993, 25-26). He proposed that the mirror images of letters restored in the non-dominant hemisphere disturbed the visual processing and caused the letters to rotate (Korhonen 1995, 163). The visual deficits have since been studied a lot and there is evidence that a small group of dyslexics seem to have visual problems, such as poor vergence control and visual distortions (Ramus 2003, 3). What causes this is not entirely
clear. One explanation for these problems is offered by the recent magnocellular deficit hypothesis.

The magnocellular deficit hypothesis suggests that the magnocellular system, which controls eye movements and visual acuity and which is sensitive to rapidly changing, lower-frequency and moving information, functions defectively and more slowly on some dyslexics (Reid 2004, 11, Korhonen 2002, 157). This could explain the problems in reading accuracy and fluency as well as lower sensitivity to contrast that many dyslexics have (Reid 2004, 11; Korhonen 2002, 157). Recently this hypothesis has been challenged by studies which claim that the visual deficits “cover the whole range of spatial and temporal frequencies” and it is thus probable that the visual difficulties are not related to magnocellular dysfunction at all but are a possible independent cause of reading disability (Ramus 2003, 3-4).

4.2.2 Differences of the hemispheres

Even though Orton's theory on the unclear dominance and the problems of visual processing did not prove to be the main cause of dyslexia the function of the hemispheres and its relation to dyslexia has been studied a lot since those days. Researchers have found out that the hemispheres of the dyslexics do differ from those of other people, and it has also been shown that even though the linguistic functions of the dyslexics, like those of other people, are usually situated in the left hemisphere, the difference between the hemispheres is not as clear on dyslexics (Korhonen 2002, 143). The researchers are not, however, sure whether this unclear dominance actually is the cause of dyslexia, like Orton thought, or whether it is the result of the disorder (Korhonen, 2002 143).

What has been discovered, however, is that the areas of the planum temporale in the back of the temporal lobes of the hemispheres are symmetric on dyslexics while on other people the left planum temporale, which is closely related to linguistic functions, tends to be bigger (Korhonen 2002, 141). Thus the symmetry of the hemispheres could be a cause for
dyslexia. Some scientists do not recognise this difference but state that the parietal areas of the brain of the dyslexics are exceptionally symmetrical and imply that the more symmetrical they are the more the person has difficulties in phonological processing, i.e. with the ability to perceive and restore phonemes and to operate with them (Korhonen 2002, 143). Some researchers point out, however, that planum symmetry is not a very deciding factor in dyslexia to begin with as “structural asymmetries are distributed along a continuum of individual degrees” (Miles and Miles 1999, 85).

Despite the planum temporale areas brain research has also shown that the magnocellular areas of at least some dyslexics contain cells that are smaller and “more variable in size and shape” and it has been proposed that abnormalities in the probable auditory magnocellular system could cause the difficulties in “processing auditory information at high speeds” and would thus be the cause for phonological difficulties (Miles and Miles 1999, 83-84). Ramus (2003, 2) offer a conflicting view as studies prove that auditory disorders “are restricted to a subset of the dyslexic population” and “it therefore seems that the phonological deficit …can arise in the absence of any auditory disorder”.

These abnormalities of the brain emerge already before the birth and during early infancy as the neuronal cells fail to connect correctly to the right areas of the brain causing the brain mechanisms to function and interact differently (Miles and Miles 1999, 82). Some studies suggest that these abnormalities in the brain development are caused by genetic factors (Poussu-Olli, 1993, 33, Galaburda 2005, 155) but some propose that environmental factors, such as biological, chemical or physical factors, that can occur prenatally, natally or postnatally may have an affect on the disorder as well (Ahvenainen and Holopainen 1999, 4). For example, Hanna-Sofia Poussu-Olli states that the lack of oxygen or nutritional disorders during pregnancy may cause these abnormalities (Poussu-Olli, 1993, 160).

The abnormalities found in the brain of the dyslexics which could explain the difficulties in processing visual, auditory and phonological information are thus apparently
mainly caused by a mutation in genes which then disturbs the migration of the neuronal cells and causes them to connect incorrectly and the different parts of the brain function and interact defectively (Galaburda 2005, 161).

4.2.3 Differences in the brain functions

Besides differences in the anatomy of the brain it has also been shown that the brains of the dyslexics function differently. During the last few decades new technology has offered new views on the research on dyslexia. For example some EEG (electroencephalogram) tests have shown that the brain wave activity of the dyslexics differs significantly from that of other people (Korhonen 2002, 145). Also tests using the ERP-technology (event-related potential), which is used to show mismatch negativity (MMN) when the brain recognise a deviating stimulus for example in a series of sounds, have shown, for example, that dyslexics have a deviating MMN when the different sound stimulus is a part of a group of sounds but not when the sounds are presented as pairs (Korhonen, 2002 147). These results have been interpreted as showing that dyslexics have difficulties especially in auditive processing (Korhonen 2002, 147) and thus difficulties in distinguishing specific phonemes in words, which is further connected to defects in phonological processing.

Also PET (positron emission tomography), which measures the metabolic activity of the brain during specific tasks, and MRI (magnetic resonance imaging), which offers “very detailed images of brain and body tissue”, have brought new information on how the brain of the dyslexic actually works and how it differs from “normal” brain activity (Miles and Miles 1999, 84-85). MRI tests, for example, indicate that the left hemisphere posterior brain systems do not function correctly on dyslexics and thus they process visual motion abnormally (Lyon and Moats 2003, 4-5). Some researchers have proposed that this would refer to “a deficit in the magnocellular system” and thus support the disputed theory (Miles and Miles 1999, 87).
Studies using PET-scan have, on the other hand, revealed for example that during a task which requires phonological processing dyslexics activated the same areas of the brain as the control group but did not do so “in concert” (Paulesu et al. 1996, 150). And unlike the control group dyslexics did not activate the insula, which “has a major role in linking the different phonological codes”, at all, which according to Paulesu et al. (1996, 152, 154) could refer to a disconnection between anterior and posterior speech areas. The dyslexics also differed from the control group in a short-term memory task as they did not activate their right hemisphere at all (Paulesu 1996, 153). This evidence would propose that dyslexics might have some kind of a disconnection-syndrome as they fail to activate all the areas needed for phonological processing at the same time but are able to activate them separately (Paulesu et al. 1996, 154).

In general, it is thus a fact that dyslexic brain function differently. What causes this is still being debated. Paulesu et al. (1996, 154) suggest that the cause is a disconnection between different phonological codes. Some, however, suggest the cause might be ‘general timing hypothesis’ because dyslexics have difficulties processing not only visual or phonological incoming information but “fast incoming sensory information...in any domain” (Miles and Miles 1999, 87).

4.2.4 Fatty acids

Biochemistry has also contributed to the research of dyslexia by offering a possible cause for the abnormal brain functions of dyslexics – the imbalance of fatty acids (Miles and Miles 1995, 86). Certain fatty acids “are known to be particularly important for visual and cognitive development” and a study showed that a dyslexic group did have an abnormal cerebral metabolism of phospholipids compared to the control group (Miles and Miles 1995, 87). According to this it might be possible that a deficiency of some fatty acids could be “a contributory factor in dyslexia “ (Miles and Miles 1995, 87).
4.3 Cognitive defects

Besides differences in the brain functions some theories suggest that dyslexics also have difficulties in processing specific information which than causes the difficulties that they have with reading and writing. These include the phonological processing deficit theory, the double-deficit hypothesis as well as the hypothesis of the difficulties in the automatisation of functions which will be introduced next in this chapter.

4.3.1 Phonological processing deficit theory

In the 1970s researchers started to question Hinselwood and especially Orton's theories, which explained dyslexia as a visual defect which was based on the spelling mistakes of the dyslexics. Orton's theory was called into question as the majority of the letter errors could not be "explained simply as visual errors", as Miles and Miles (1999, 31) point out, but many of them seemed to be caused by articulatory or phonological similarity rather than visual similarity (Miles and Miles 1999, 31). Several studies have since revealed, for example, that dyslexics have great difficulties in separating and recognising single phonemes, in the segmentation of words into phonemes and in the connection of separate phonemes, as well as in keeping series of phonemes or letters in the short-term memory (Luki-työryhmä 1999, 10; Korhonen, 2002, 150). Another sign of deficit in the phonological processing ability is that dyslexics are often poor in repeating non-words (like kib or sero), in rhyming and in spoonerisms (for example blushing crow/crushing blow) (Korhonen 2002, 150; Random House Webster's Concise College Dictionary 1999, 790; Seymour et al. 2003, 174).

The phonological processing theory explained the origin of these difficulties and since then it has been supported by the vast majority of researchers as the main cause for dyslexia (Wolff 2005, 40).

According to this theory phonological processing consists of three components or abilities: phonological awareness, which refers to the ability “to categorize and split
phonological material”, phonological recoding in lexical access, which refers to the processes that are needed when “a non-phonological stimulus is converted into a phonological output”, and phonological working memory or verbal short-term memory (Wolff 2005, 37, Lumme and Lehto 2002, 207). The defects of the phonological awareness can be clearly seen in the examples described above and defects of the phonological recoding explain the difficulties with, for example, reading.

The phonological working memory consists of three parts, as well: visuo-spatial sketch pad, the phonological loop and the central executive. The visuo-spatial sketch pad organises visual and mental information (Lehto and Helander 1996, 330). The phonological loop contains a phonological store, which stores linguistic information briefly and retains order of information, and an articulatory loop, which refreshes the brief representations in the phonological store (Wolff 2005, 38).

The central executive coordinates the different stores, transfers information to and from the long-term memory and thus transfers the information from the lower levels to the higher ones (Lehto and Helander 1996, 330, Wolff 2005, 38). In order to be able to read fluently the letters and the sentences need to be restored temporarily into the working memory, where it can be processed further and from where the information can be transferred to the higher levels (Wolff 2005, 38).

According to studies dyslexics do not have difficulties in storing the phonological information or with the capacity of the working memory but in phonological awareness and in processing phonological information (Wolff 2005, 38, Lehto and Helander 1996, 331). The poor processing may also complicate the restoration of words from the memory and can thus explain the difficulties in vocabulary acquisition of the dyslexics (Wolff 2005, 39). Korhonen (2002, 151) points out, however, that the defects of the phonological processing do not explain all the different types of dyslexia especially in languages which have strong
grapheme-phoneme correspondence. The theory does not explain either the difficulties with, for example motor control and the visual problems (Wolff 2005, 40).

4.3.2 The double-deficit hypothesis

Another theory which is closely connected to phonological awareness deficit theory is the double-deficit hypothesis. Like mentioned above, the phonological awareness deficit theory does not explain all the types of dyslexia in languages with regular orthographies. Studies show that children with phonological awareness deficit do not have much difficulties in acquiring phonological coding in languages with regular orthographies, and thus learn to read fairly easily, but show difficulties in reading fluently (Wimmer et al. 2000, 669). Researchers noticed that many dyslexics were slow in naming for example colours, numbers and letters and after having studied dyslexics of different nationalities they also noticed that slowness in naming-speed appeared to be closely related to dyslexia especially in languages with regular orthography, such as German, Finnish and Spanish (Korhonen 2002, 152).

The double-deficit hypothesis recognises thus the phonological awareness deficit as a key factor in dyslexia but suggests that the naming-speed deficit is also another major factor especially in languages with regular orthographies (Korhonen, 2002, 153). This theory explains why all dyslexics do not have severe difficulties with phonology but can still be slow in reading. In fact, a group of researchers noticed that dyslexics could be divided into three subtypes according to their deficits, one having only phonological awareness deficit but no naming-speed deficit, another with naming-speed deficit but little phonological awareness deficit and a third one with both deficits (Wimmer et al. 2000, 668).

What causes the difficulties in naming speed is not yet known but it has been suggested that they could be caused by slowness in the processing of functions or, like mentioned earlier, it could be caused by magnocellular abnormalities (Korhonen 2002, 153, Ramus 2003, 1).
4.3.3 Hypothesis of the difficulties in the automatisation of functions

Besides reading and writing, many dyslexics have difficulties in tasks that require motor skills (Ramus 2003, 4). All of these tasks require the ability to perform many different kinds of functions at the same time and automatically (Korhonen 2002, 155). Researchers have thus suggested that these problems in connecting these different subprocesses together and in the automatisation of functions may be caused by general temporal processing or timing deficit or the cause can be a cerebellar dysfunction (Korhonen, 2002, 155, Ramus 2003, 4). This view is supported by neurobiological studies on the cerebellum, which has a key role in the automatisation of different motor functions (Korhonen 2002, 156). These studies confirm that dyslexics usually perform weaker in tasks which measure especially the functioning of the cerebellum, such as balance and posture tests, and they also show that the increase in the metabolism of the cerebellum is slighter on dyslexics when performing tasks which require automatisation than it is on other people (Korhonen 2002, 156). Korhonen (2002, 156) also mentions that dyslexics have more often abnormalities in the cell structure of their cerebellum. The connection between dyslexia and motor difficulties, as is the case with visual and auditory difficulties, is being debated, because some studies “have failed to find any link between these two disorders” (Ramus 2003, 4).

So, as a conclusion, the main cause for dyslexia is a genetic mutation which affects the neurobiological structures and functions of a dyslexic person (Luki-työryhmä 1999, 10). How these deviating structures and functions then affect a person’s ability to read and write and why dyslexics have heterogeneous difficulties and disorders is still not yet entirely clear. At the moment there are many theories and hypotheses on the causes of dyslexia. None of them can, however, explain the disorder entirely because, like mentioned before, it is probable that there are many different types of dyslexia and many of them seem to be the result of various different problems occurring at the same time (Luki-työryhmä 1999, 10) but together they offer quite a good view on the possible origins of the disorder.
5. Subtypes of dyslexia

Researchers noticed quite early on, already in the 1950s and 1960s, that dyslexics were not a homogeneous group and started to classify them into different subtypes in order to understand the disorder better and also in order to create remedial methods for it (Gayán Guardiola 2001, 13; Snowling et al 2004, 558). Next I will present a couple of the categorizations that have been created over time.

5.1 Classification according to the problems with reading and writing

Researchers, who were interested in finding remedial methods for the disorder often divided the dyslexics into different subgroups according to the problems that the dyslexic children had with reading and writing (Snowling et al. 2004, 561). Most often the problems have been divided into linguistic and visual difficulties (Korhonen 1995, 179).

5.1.1 Myklebust and Johnson’s categorisation

Myklebust and Johnson divided dyslexics into two subgroups: ones with visual dyslexia and the others with auditory dyslexia. The visual dyslexics have difficulties in “remembering orthographic patterns” and thus they “cannot learn words as a whole component” (Wolff 2005, 25; Dyslexia Homepage: Types). Their reading and writing often contains reversals, either in individual letters or in entire words (Dyslexia Homepage: Types). The auditory dyslexics, on the other hand, have difficulties in “discriminating between similar phonemes” and linking “the auditory equivalent to the visual component” (Wolff 2005, 25; Dyslexia Homepage: Types).

5.1.2 Boder’s categorisation

Boder created three different subtypes based on a qualitative analysis of reading and spelling errors of dyslexic children (Snowling et al. 2004, 561; Wolff, 2005, 25). The dysphonetic
(phonological) dyslexics (67% of the population) have difficulties in “phonological decoding and spelling” (Wolff 2005, 25). This means that they have difficulties especially in grapheme-phoneme integration and do not analyse words phonetically but spell them as whole components, and are thus unable to spell words that are not “in their sight vocabulary” (Korhonen 2002, 161, Snowling et al. 2004, 461).

The second group, dyseidetic dyslexics (10% of the population), on the contrary, analyse words based on the grapheme-phoneme integration but have difficulties in memorizing the visual shapes of words and because of this they have problems in “building up a sight vocabulary” (Korhonen 2002, 161; Snowling et al. 2004, 561-562, Wolff 2005, 25). The third subgroup in Boder’s classification is the mixed group or alexia group (23% of the population) (Wolff 2005, 25; Lachmann et al. 2005, 106). Children in this group have both dysphonetic and dyseidetic problem patterns (Wolff 2005, 25).

5.2 Classification according to the neuropsychological symptoms
Apart from categorizing dyslexics according to visual and auditory deficits some researchers, for example Mattis, French and Rapin and Bakker classified dyslexics into different subgroups according to their neuropsychological symptoms (Snowling et al 2004, 559).

5.2.1 Mattis, French and Rapin’s categorisation
Mattis, French and Rapin tested both the linguistic and spatial as well as the motor skills of dyslexic children (Korhonen 2002, 162). According to the results they divided them into three subgroups: one with an articulatory and graphomotor deficit, the second with a linguistic deficit, and the third with visuo-spatial difficulties (Snowling et al. 2004, 559). The dyslexics in the first group had difficulties in connecting phonemes and with speech articulation as well as with “graphemic motor skills “(Korhonen 2002, 162; Snowling et al. 2004, 559). The ones with a linguistic deficit, on the other hand, had anomia, i.e. difficulties with naming, and
showed problems in discriminating speech sounds (Korhonen 2002, 162; Snowling et al. 2004, 559). Children with visuo-spatial difficulties performed better in the tests measuring verbal IQ than in the ones measuring performance IQ (Korhonen 2002, 162) and they had “predominantly problems with visual discrimination, and visual memory” (Snowling et al. 2004, 559).

5.2.2 Bakker’s categorisation
Bakker’s classification is based on a theory of how the predominant use of hemispheres changes as children learn to read and how deviations from this model cause different kind of problems (Bakker 1992, 102-104). According to Bakker’s Balance Model of Learning to Read, a child as he starts to learn to read he analyses the perceptual and directional features of a text which are processed in his right-hemisphere. Later, when he becomes more skilled he needs to analyse the semantic and syntactic features of the text as well, which require processing in the left hemisphere (Bakker 1992, 102-104). Thus the child shifts from using the right hemisphere into using more the linguistic processing in his left hemisphere. According to Bakker’s studies dyslexic children either do not move from using the right-hemispheric strategies into the left-hemispheric ones or they do it too early (Bakker 1992, 102-104). In both cases the reading suffers because fluent and accurate reading requires the use of both, right- and left-hemispheric strategies, according to the text at hand (Korhonen 2002, 163). Based on the deviations from the Balance Model Bakker divided the dyslexics into two categories, into P-types (perceptual) and L-types (linguistic) (Bakker 1992, 104; Korhonen 2002, 163)

The P-type children “start to learn to read appropriately…by the predominant generation of right-hemispheric reading strategies, but who fail to shift to the predominant generation of left-hemispheric strategies” (Bakker 1992, 104). Their reading is rather slow and accurate but also fragmented and hesitative, because the pay more attention to the
perceptual features of the text (Bakker 1992, 104; Korhonen 2002, 163). The L-type children also start to read appropriately but they “make the hemispheric shift too early” (Bakker 1992, 104). They read fairly fast but because they “disregard the perceptual text features” their reading is hasty and inaccurate and they make many substantive errors, such as omissions and additions (Bakker 1992, 104).
6. The problems caused by dyslexia

Dyslexia does not only cause difficulties in reading and writing but also in other areas that may make learning more problematic. Next I will discuss some of these problems, first some general difficulties caused by dyslexia and then difficulties which affect especially reading and writing and after that I will concentrate on the difficulties that Finnish dyslexics have with foreign language learning and especially with English.

6.1 General problems

The first symptoms of dyslexia can be perceived quite early, well before a child even starts learn to read and write. The first signs of problems of the linguistic development can be seen already on babies. Dyslexic children are often late in developing speech, they babble only a little and the babbling contains only a few consonants (Luki-työryhmä 1999, 18). Later, as they start to speak there may be sounds missing from their speech or the sounds can switch places and rhyming is impossible for them (Takala 2006, 69). Takala (2006, 69) also points out that dyslexic children use childlike speech rather long. Another sign of possible dyslexia can also be that dyslexic children do not have many communicative gestures either and they have overall difficulties in understanding speech and producing it themselves (Luki-työryhmä 1999, 18).

Difficulties with motor skills, which can also be an indication of dyslexia, can be seen quite early on, as well. Dyslexic children are often clumsy, and they may have difficulties in performing tasks that require fine motor skills (Reid 2004, 6). Poor pencil grip makes writing and drawing difficult and difficulties in the eye-hand coordination cause difficulties not only in writing but at sports, as well (Reid 2004, 6). Dyslexia may also be connected to difficulties in perceiving space and time (Luki-työryhmä 1999, 11). Dyslexics often have difficulties in identifying left and right and understanding these directions in their environment, and perceiving and learning consecutive items, such as months or alphabets.
addition and subtraction in mathematics, are also problematic for them (Collier's Encyclopedia 119, 462, Halonen 1999, 9). Difficulties with short-term memory and inefficient organisational strategies make remembering instructions and learning new material difficult, and responding to tasks and completing, for example, exams takes a lot of time (Reid 2004, 6). Dyslexics often have problems remembering basic information about themselves, such as age address or date of birth, and easily forget where they have put things or forget to do their homework (Reid 2004, 6-7).

6.2 Problems with reading

Problems that a dyslexic has with reading can be affected by both problems of the visual as well as of the phonological processing. Dyslexic children have difficulties in perceiving two-dimensional pictures and thus perceiving the forms of the letters and learning the connection between the forms and corresponding sounds is very difficult (Hintikka 2000, 200; Takala 2006, 69) The problems of the phonological processing make reading slow, monotonous and hasty as finding the grapheme-phoneme correspondence and finding meaning to the written words takes time (Moilanen 2002, 14; Halonen 1999, 8). Dyslexic readers often guess, correct and repeat while they read, add letters to words, omit existing letters or word endings, change meaningful words into non-words or substitute them with other similar words (Ahvenainen and Holopainen 1999, 75; Halonen 1999, 8; Mikkelä 1985, 34; Takala 2006, 69).

The problems of the visual processing make reading difficult as single letters or even entire lines may seem to move and change places and thus the text may become impossible to understand (Moilanen 2002, 15). The visual similarity of different letters also causes difficulties as they easily get mixed up with one another by rotating and reversing (for example b/d, p/q, m/w, h/y, s/z, n/u) and entire words which are visually similar can get mixed up (for example gender-garden), as well (Poussu-Olli 1993, 41; Ahvenainen and Holopainen 1999, 75). Sometimes words get substituted with other semantically similar
words, for example the word *car* may be read as *bus* (Reid 2004, 5). The slowness and laboriousness of the mere mechanical reading as well as the poor short term memory make understanding the texts, finding the key ideas in them and remembering what was just read difficult as well (Moilanen 2002, 15; Halonen 1999, 8). Besides reading and understanding long, complex words, small and rather abstract words, such as particles and pronouns, can also cause problems to dyslexic readers and make understanding the text difficult because the meaning of these words can not be connected to any image which might make understanding it easier (Hintikka 2000, 200-201, 218).

6.3 Problems with writing
The problems that dyslexics have with writing are connected to and quite similar to the ones with reading. Because of the problems of the motor skills and eye-hand coordination the writing is slow: creating the needed lines for the letters with the pencil and trying to fit the letters on a straight line is sometimes very hard and thus the handwriting becomes messy and difficult to read (Moilanen 2002, 113). Because of the difficulties of the phonological and visual processing the text is full of spelling mistakes (Reid 2004, 7). Similar looking letters, such as b-d-p-g-q, n-u and m-w, tend to rotate and letters that sound the same, or are pronounced in the same way or in the same place (a/o, u/o, u/v), get mixed up (Mikkelä 1985, 32-33; Poussu-Olli 1993, 41). The quality of the sounds also disturbs the writing and voiced and voiceless sounds are often written incorrectly (Mikkelä 1985, 33)

Parts of the letters, for example the horizontal line from the letter *t* or one line from the letter *m*, or punctuation marks and capital letters can also be missing (Moilanen 2000, 21, 24). The letters or entire syllables can also change places inside the words or get entirely omitted, or there can be additional letters or syllables in the words (Reid 2004, 7; Moilanen 2002, 21-22,113). Poor organisational skills and short-term memory as well as difficulties in operating with grammar structures, spelling and meaning at the same time often cause the
texts written by dyslexics to be illogical and incoherent (Moilanen 2002, 15; Reid 2004, 7). The words in the sentences may be in the wrong order, some logical words may be missing or the whole logic of the sentence may be impossible to understand (for example *He goes school and tok wiht a bounche of friens ther* (Moilanen 2002, 23).

6.4 Problems with foreign language learning

Because of the difficulties in their mother tongue dyslexic children often face problems in learning a foreign language (Mikkelä 1985, 125). Ganschow et al. (1991, 533, 539) studied successful and unsuccessful foreign language learners and their skills for example in native oral and written language and support the view that “difficulties with phonological and syntactic skills in one’s native language may be an indicator of potential foreign language learning difficulties”.

Even though dyslexia often causes a lot of difficulties already when the child learns to read and write in his/her mother tongue, it is also possible that the disorder only manifests itself when he/she starts to learn a foreign language (Moilanen 2002, 16). Some children are able to develop compensational strategies to overcome their difficulties in their mother tongue, but as they are not able to use these strategies with a language that has a different kind of structure, the problems arise (Moilanen 2002, 16). Next I will present some difficulties that Finnish dyslexics have in learning English as a foreign language.

First I will discuss some general problems that dyslexics have with foreign language learning and especially what kind of difficulties the poor grapheme-phoneme correspondence of English causes for them. Then I will describe briefly other difficulties that dyslexics face in the different areas of foreign language learning, such as grammar, listening comprehension and pronunciation.
6.4.1. General problems

Foreign language learning requires a lot of skills that are rather weak on dyslexics, such as phonetic coding, grammatical sensitivity and memorizing skills (Huopalainen & Ruuttunen 1999, 19). Many of the difficulties that Finnish dyslexics have in learning English as a foreign language are caused by the poor grapheme-phoneme correspondence of English (Moilanen 2000, 151). Because the written word may differ a lot from how it is pronounced, a dyslexic person may not be able to find meaning for it in his/her memory and thus reading and understanding written texts may become extremely difficult (Moilanen 2002, 93). The poor grapheme-phoneme correspondence of English affects writing and spelling as well (Halme 2000, 61). Because of difficulties in perceiving different sounds dyslexics tend to write words as they are pronounced, (for example enof – enough, sed – said), and similar sounding letters tend to get mixed up (Moilanen 2002, 195, 113). Due to this dyslexics often have to learn two different forms of one word – how the word is written and how it is pronounced (Mikkelä 1985, 125).

6.4.2 Reading

The same difficulties that a dyslexic has when reading in his/her mother tongue, such as letters moving, rotating and changing places etc. are obviously present when he/she reads a foreign language. In addition to this, the different word order and grammatical structures of English make understanding the text difficult (Moilanen 2002, 92-93). Moilanen also points out that especially the small grammatical words, like articles and prepositions, that do not exist in Finnish disturb dyslexic readers and thus understanding the text and the deictic relations within the text become problematic. He also states that because of these problems the reading is very slow and laborious and the reader easily becomes distracted, begins guessing the meaning of the text or even stops.
6.4.3 Writing and spelling

The same difficulties that dyslexics have in writing their mother tongue are reflected in writing and spelling in a foreign language. Just like in their mother tongue letters may change places within a word, get omitted or there may be too many of them (Moilanen 2002, 22). Difficulties in remembering English words makes a dyslexic sometimes use self-made words (Halme 2000, 61). Small grammatical words, such as prepositions and articles, which are not pronounced very clearly in speech, are also often left out in written texts (Moilanen 2002, 114).

For many dyslexics producing written texts in a foreign language is almost an insuperable problem (Moilanen 2002, 113). According to Moilanen (2000, 156; 2002, 115), this may be because the students consider producing written texts as a performance rather than as an exercise, and focusing on spelling, grammar and on the content of the text at the same time is so confusing that the texts easily become illogical and incoherent. The texts produced by dyslexics are often quite simple: they use plenty of main clauses and the same structures over and over again (Halme 2000, 61). Sometimes the train of thought is lost in the middle of the sentence and thus there may be some words missing from the sentence or there may be too many of them, or the sentence may continue later on in the text (Moilanen 2002, 115). Understanding and using the grammatical structures of English is also very difficult for dyslexics (Halme 2000, 61). The dyslexic students may remember many grammar rules by heart but do not know how to use them themselves (Willberg et al. 2006, 234). They may not even be able to use the structures that are the same in their mother tongue, because they have difficulties in seeing similarities (Moilanen 2002, 151).

6.4.4 Vocabulary

Vocabulary is probably one of the areas of English as a foreign language that causes the most difficulties for dyslexics (Willberg et al. 2006, 234). First of all, because of difficulties with
auditory processing dyslexics do not necessarily recognise the phoneme structure or hear all the phonemes in a word (Moilanen 2002, 194-195). They may not even recognise affixes or inflectional endings at all and thus finding a meaning for a word and creating new words is impossible (Moilanen 2002, 194; 2000, 153). Sometimes the phonemes or syllables of a word may get mixed up or they may be forgotten half way which makes retrieving a meaning for the words from the memory as well as memorizing new words slow and quite impossible (Moilanen 2002, 193-194; Viskari 2005, 92). The meaning of the word may also get mixed up with another word that sounds the same or is from the same semantic field because the memory is so poorly organised (Moilanen 2002, 194-195).

6.4.5 Listening comprehension and pronunciation

Because of functional problems in the auditory channel many dyslexics have difficulties in managing fast auditory information (Viskari 2005, 74; Moilanen 2002, 46). The difficulties with phonological processing they have difficulties in distinguishing different phonemes and thus words get mixed up (Moilanen 2002, 49). Dyslexics also find it difficult to hear and understand the structure of heard words: they can not distinguish affixes or rhymes, or even tell what the first phoneme of a word is (Moilanen 2002, 49). What makes the matter even worse is that dyslexics easily forget what they just heard because of poor short-term memory (Moilanen 2002, 48). Because of these problems with auditory information learning how to pronounce words is also very difficult: if you can not distinguish different sounds or even hear others at all, pronouncing them is quite impossible (Moilanen 2002, 69). According to Moilanen (2002, 70), especially the different s-sounds, the difference between voiced and voiceless consonants (p-b, k-g, t-d), and weak sounds like the h- and th-sounds of English are difficult for Finnish dyslexics.
6.4.6 Grammar

Learning the grammar of English and using it themselves is difficult for Finnish dyslexics because they often have many difficulties in understanding the terminology and the abstract concepts that are used in grammar teaching (Viskari 2000, 96). As mentioned before, dyslexics may learn the grammar rules but applying them into practice seems to be difficult because they have difficulties in seeing patterns and analogy between structures (Willberg et al. 2006, 234; Viskari 2000, 96, Moilanen 2002, 150). They may even have problems in understanding grammar structures that are similar in their mother tongue (Moilanen 2002, 151). Thus grammar is often left somehow intact and separate from the language because its function is so unclear (Moilanen 2002, 150).
7. Earlier studies

Even though there has been plenty of research done over the years on dyslexia, it has mainly focused on the etiology of the disorder, on the early signs of the disorder and how to help the dyslexics as early as possible. The research has also concentrated mainly on the difficulties which dyslexics have with their mother tongue. Even though it is obvious that dyslexia considerably affects the processes of learning to read and write as well as other processes that require linguistic skills, its effect on foreign language learning has been studied relatively little. I managed to find a couple of relatively new pro gradu theses that studied Finnish dyslexics and foreign language learning. Next I will briefly introduce these studies and their findings.

7.1 Opas and Paloheimo-Pikkarainen's study

Opas and Paloheimo-Pikkarainen studied in their pro gradu thesis in 2001 how dyslexia manifested itself in learning English as a foreign language in the senior secondary school in Finland. They studied the compositions of the Matriculation Examination of spring 1995 written by 50 dyslexic students and 50 non-dyslexic students in order to find out what kind of errors the two groups made in their compositions, how the errors differed from each other and whether the difference of the error types between the two groups could be explained by dyslexia.

First they divided the different mistakes into 11 different categories according to the list used by the dyslexia committee of the Matriculation Examination Board. After comparing the two groups and the mistakes they had done the only category in which there was a statistically significant difference was spelling which was thus the category they decided to concentrate on. The spelling mistakes were then divided into 16 different categories according to the typical dyslexic mistake categorization by Ruoppila, Röman and Västi (1969) in order to find out the nature of the spelling mistakes.
The result of the study was that the mistakes by the dyslexics divided more equally between the different mistake categories whereas the mistakes of the non-dyslexic group concentrated on specific mistake categories. The non-dyslexics made the most mistakes in categories *missing letter*, *wrong letter*, *mistakes in compounds*, *mistakes in punctuation* and *additional letter and other mistakes* whereas the dyslexics made the most mistakes as well in the same first three categories as the non-dyslexic pupils and in categories *non-word* and *additional letter and other mistakes*. The mistakes in the first three categories and in the categories *additional letter and other mistakes* could be explained by Finnish interference and as both groups surprisingly made as much mistakes in these categories the mistakes could not be explained by dyslexia.

The clearest differences between the two groups, however, were in categories *capital/small initial letter*, *missing letters in geminations*, where the non-dyslexics did not make almost any mistakes, and in category *non-word* where the percentage of the dyslexic group was almost twice as high as the other group's. These mistakes could be explained by Finnish interference but especially the mistakes in the categories *missing letters in geminations* and *non-word* can be seen as typical dyslexic mistakes.

### 7.2 Viskari’s study

The goal of Viskari’s study was to find out what kind of foreign language learning difficulties senior secondary students have and to offer language teachers (especially teachers of English) who work with students with learning difficulties in senior secondary school both theoretical and practical solutions to overcome these problems. Viskari’s study was based on literature on learning difficulties and foreign language learning as well as on the writer’s own experiences as an English teacher. The study thus gathered together the present knowledge of the foreign language learning difficulties without really offering anything new.
The study carefully went through all the different areas of language learning, such as reading, speaking and examinations. Most of the difficulties that the students with learning difficulties have that were presented in the study were based on Moilanen’s (2002) book which was one of my main sources as well. In each chapter Viskari concentrates on one area of language learning at a time, explains what difficulties the students face and offers language teachers solutions to overcome these problems. The study does not thus come to any main conclusion what the main difficulties are, but offers solutions for each area.

7.3. Huopalainen and Ruuttunen’s study

The aim of Huopalainen and Ruuttunen’s study was to describe the foreign language learning (English) and need for support of two dyslexic elementary school pupils. In addition, the thesis aimed to discover what teaching methods would benefit the dyslexic pupils the most. Besides studying the lessons and interviewing the two pupils Huopalainen and Ruuttunen also interviewed the mothers and special education teachers of the students. In their thesis they described what kind of lessons they held for the pupils, which teaching methods they used and how the students responded to the teaching.

The results of the study showed that slowing the pace of the teaching, positive feedback and repetition had a positive effect on the learning of the students. The difficulties in understanding and recognising similarities between English and Finnish were mostly the cause of the problems in learning English for these two pupils. Huopalainen and Ruuttunen point out that support in their mother tongue would also help dyslexic pupils in foreign language learning. Besides this the foreign language teaching of dyslexic pupils should concentrate heavily on the basics of the language. They suggest that instead of doing the usual exercises of the English books, where separate pieces of information are moved from one place to another, the teachers of dyslexic pupils should use more drama teaching, because for
example dialogues resemble more the real-life situations where foreign language is used and this may help the dyslexics to overcome their normal difficulties.
8. Empirical study

In this chapter I will describe the data behind my empirical study, how the data was collected, what it consists of, how the data was analysed, what the results of the study were and which structures cause the most difficulties for Finnish students in producing written texts in English as a foreign language and how they manifests themselves.

8.1 Purpose of the study and collecting the data

The purpose of this empirical study was to find out which structures or areas of English cause the most difficulties for Finnish dyslexic students writing English as a foreign language. Collecting the data for this thesis turned out to be extremely difficult. Even though dyslexia is a rather well known disorder in Finland at the moment and there are many organisations and associations for dyslexics throughout the country, finding dyslexic students was almost impossible. Fortunately, I managed to get into contact with some English teachers who work with dyslexic students or who had dyslexic students attending their courses at that moment, and who were eager to cooperate and I asked their students for permission to send me copies of some of their compositions.

The final data of my empirical study consists of 40 compositions written by 10 dyslexic senior secondary school students and one vocational school student1. All of the students had been diagnosed as dyslexics and the severity of their disorder varied from mild to severe. I did not ask in which situations the compositions were written in, but presumably at least some of them were written at school as a part of an exam, and at least a couple of the compositions were known to have been written at home as an exercise. The topics of the compositions were known to have been written at home as an exercise. The topics of the

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1 The results of this study are only suggestive because the 40 compositions were written by altogether 11 students (one composition from six the students, two compositions from one student, three compositions from two students, 10 compositions from one student and 16 compositions from another one), who are thus not equally represented in the data. Although the data is arguably not ideal, it was nevertheless thought that the material was representative of compositions written by dyslexics.
compositions varied and besides regular compositions there were also book, film and short story reviews as well as letters. Some of the topics of the compositions were probably taken from the Matriculation examinations because different students in different schools had been writing about the same topic. Here are some examples of the topics: My first school day, Dear teacher, My parents' schooldays, Love and marriage, A perfect day, Safety on the roads, A meal I can't forget, Dear diary, My first love..., Why we need nature?, The role of music in my life, My ideal holiday. The length of the compositions varied considerably, as well, from 102 words to as many as 466 words, but on average the compositions included 130 – 200 words, which is the average length for compositions in the Matriculation examinations.

8.2 Data analysis

I began analysing the data by identifying all the mistakes in the compositions and by dividing them into 11 different error categories. The categories are based on the categories of the error list used by the dyslexia committee of the Matriculation Examination Board (Opas et al., 2001, 44). The categories are as follows:

1. incomprehensible sentence/phrase
2. congruence
3. ungrammatical and inconsistent use of verb
4. nouns
5. pronouns
6. articles
7. prepositions
8. spelling
9. false idioms
10. self-made words
11. sentence structure
The first category, incomprehensible sentence, includes sentences in which the student has spelt words incorrectly and/or used word order so badly that the meaning of the sentence is impossible to understand even in the given context e.g. *I thins anythings, but I cannot make*. The category of congruence (2) includes errors in subject-verb agreement e.g. *it don't matter*. The category of ungrammatical and inconsistent use of verb (3) contains errors in the use of different verb forms, active and passive tenses, modal auxiliary verbs and the use of double negation. Mistakes in the use of singular and plural noun forms, errors in the use of the genitive forms as well as confusion of nouns with other word classes e.g. *Finnish-Finns* belong to the category of nouns (4).

The fifth category, pronouns, contains mistakes in all different pronoun types i.e. demonstratives, interrogatives, personal and relative pronouns, possessives, negatives, quantifiers and reciprocal pronouns e.g. *me would come problem with mine conscience*. I have also included errors in the use of the introductory *it* and *there*, e.g. *In language course is only I, a young man and a lot old women*, in this category. The category of articles (6) contains the omission or unnecessary use of articles and the confusion of indefinite and definite articles. The seventh category, prepositions, includes the incorrect use of prepositions with verbs, nouns, adverbs, adverbials or adjectives. Category 8 includes all spelling mistakes.

The category of false idioms (9) contains idioms and phrases which are not used in the right context, have parts of them missing or are otherwise incorrectly structured, e.g. *two time the week, classrooms were similar than today, lot of friends*. In the category of self-made words (10) I included words and non-words in which the interference of Finnish was clear e.g. *overspeeding, flowerly backpacks*. This category also contains words that were not used in the right context or were mixed up with other words, often from the same semantic field. I also included the confusion of adverbs with adjectives, e.g. *happy->happily and similar errors in this category. The last category of sentence structure (11) contains stylistic mistakes i.e.
repetition, wrong stylistic register etc., and structural mistakes, such as wrong word order, omission and unnecessary adding of words.

8.3. Results of the analysis

The total amount of errors in the compositions was 1191. Most of them were found in the use of articles (246 mistakes), in spelling (218 mistakes), in sentence structure (144 mistakes) and in the use of prepositions (139 mistakes).

![Chart 1. The amount of errors in different error categories](image)

8.3.1. Articles

In the category of articles (6.) the most errors were caused by not using the definite article *the* (44, 3%) or the indefinite article *a* (41, 1%) when needed. This is not surprising as they are not used in Finnish language and can thus be quite easily forgotten and left out. Difficulties in the use and function of articles could also be seen in the fact that there were a couple of errors
where the writer had used the indefinite article instead of the definite article, but surprisingly there were no mistakes the other way round.

8.3.2. Spelling

The category with the second most mistakes was spelling. The mistakes were divided into 16 different categories according to the typical dyslexic mistake categories by Ruoppila, Röman and Västi (1969, 9):

1. capital or small initial letter
2. reversal/rotation
3. missing letter in gemination (i.e. double letter sequences)
4. missing letter in long vowels
5. missing letter
6. m/n confusion
7. ng-sound mistakes
8. wrong letter
9. mistakes in compounds
10. mistakes in punctuation
11. missing word
12. wrong but meaningful word
13. wrong word ending
14. non-word
15. missing syllable
16. additional letter and other mistakes

Mistakes in the category 1 mean that there are small letters at the beginning of the sentences or capital letters in the middle of them, or that words beginning with a capital letter
are written with a small one and vice versa. Reversal and rotation are very typical errors for dyslexics. Reversal means that letters change places inside a word e.g. mohter – mother and in rotation the letters turn upside down or around e.g. p-b, d-b, d-g. The confusion of letters ‘m’ and ‘n’ as well as difficulties spelling the ng-sound (e.g. now-know) are in their own categories. Categories 3, 4 and 5 contain mistakes in which letters are missing from words. These include for example mistakes where doubled consonants are missing from double letter sequences (e.g. litle) or when instead of diphthongs there is just one vowel. Besides missing letters dyslexics can also miss entire words from sentences (11.) or forget one syllable from a word (15.). Because of difficulties in distinguishing different sounds and thus with pronunciation dyslexics tend to write words with wrong letters and add unnecessary letters. The category of non-words includes words in which there are two or more spelling mistakes as well as words that are totally incomprehensible.

The spelling mistakes of these compositions could be fitted into 14 of the 16 categories. No mistakes were found in the categories 4 missing letter in long vowels or 10 mistakes in punctuation, probably because long vowels are not very common in English and punctuation is quite free in English, as well. The errors in all categories showed that the majority of the spelling mistakes were caused by writing the words as they are pronounced. This kind of errors could be found in 7 different categories. Also voiced and voiceless consonants as well as the quality and quantity of consonants and vowels seemed to cause errors in various categories. The most mistakes were found in the categories 8 wrong letter; 61 mistakes, 16 additional letter and other mistakes; 41 mistakes and 5 missing letter; 37 mistakes.

8.3.2.1 Wrong letter

Many of the errors in this category were caused by writing the words according to their pronunciation, e.g. shoss – shoes, coorses – course’s, staff – stuff, inough – enough, distroyed
– destroyed, injoy - enjoy. Also the distinction between voiced and voiceless consonants e.g. studend – student, proect – protect, halv – half, as well as sounds that are not used in Finnish language very often /s/, /ʃ/, /tʃ/, e.g. sheaper – cheaper, plaze – place, lissen – listen and the correct way to write /k/ sounds, e.g. teknical – technical, musik – music, seemed to be difficult for the dyslexics. There were also signs of similar looking letters getting mixed up with each other e.g. great – great, favourite- favourite. Surprisingly, the correct spelling of small, very probably also familiar, words seemed to be problematic for some dyslexic students, as well, as the words is, it and in tended to get mixed up.

8.3.2.2 Additional letter and other mistakes

A lot of the errors in this category, as well, were written according to their pronunciation e.g. ounly, teatchers, houers, almoust, booring. In addition to this also the quantity of particular consonants seemed to cause difficulties for dyslexics, especially adjectives that end with one ‘l’ but have two in their adverb form, e.g. usuall, traditionall, succesfull, as well as words beginning with al-, e.g. allmost, allways. The majority of the mistakes in this category, however, were pure spelling mistakes e.g. mynth – myth, appereciated, peroid, bungs – buns, eacht, or mixtures of two different words, trailway – railway, peans – peas. In some cases it was quite obvious that the writer had confused the word with another word that had an entirely different meaning but sounded the same, e.g. Stare (There) were a lot of student in the classroom; I live fantasy words (world); If I taking to (the) money; ...a boat each (which) sinks. Also the influence of other parts of speech could be seen in some words. For example some adjectives had the ending -y that is usually used with adverbs and some were written with the ending -s that is used with nouns, e.g. cleary, populary, funnys, artistics.
8.3.2.3 Missing letter

Again, pronunciation was the reason why the majority of the words in this category were spelt wrong, e.g. *bak, dosn’t, intresting, exept, wich – which, were – where.* However, a large number of the mistakes were also caused by difficulties in distinguishing the quality of different sounds, especially /∫/ and /θ/ sounds e.g. *punisment, Finnis, fasionable, someting, tree – three, monts – months.* Some of the letters in the words seemed to be missing because they are very short or not pronounced very strongly and thus it is rather difficult to hear them in the word e.g. *nowdays, parens, television, rive – drive.* Rest of the misspelt words could not be put in a particular group but they were regular spelling mistakes.

8.3.3 Sentence structure

The third category that had the most mistakes was category 11 sentence structure. The mistakes in this category could be divided roughly into different groups. Most of the mistakes were purely structural errors where the idea and the meaning of the sentence could be understood but the words in the sentence were used incorrectly or the structure of the sentence was defective, often because of Finnish interference e.g. *…for everybody surprising…; I really hope that from this courses is something help; I have tired to be mr. nice guy; …therefore mohter scared hers son who is governor in today; …our should be satisfied that, what we have.*

Sometimes the structure suffered because there was a word or words missing from the sentence. Most often these were small words like prepositions, articles and introductory *it* and *there* e.g. *Normally in sauna is 100-120 grades…; You have made possible me to live easier life…; We only played our first day at school; I live fantasy words and walk hear in clouds.* Some sentences, however, lacked even verbs and pronouns, e.g. *Rome beautiful city we were loved it; School is very big and afraid to in; All foods mixed together.*
Many of the mistakes also showed that dyslexics have difficulties using the English grammar in their compositions. Very often the sentences had been structured according to Finnish word order, e.g. *I think that red clothes and flowerly backpacks was fashion first classers among; ...can the hottest sauna be over 60 °C; ...charming person, who have I ever met; New life start this day and school; Many people live in cities and become urbane more and more*, and especially the adverbs were in wrong places, e.g. *I liked also wash the dishes; that I allmost can feel it on skin; I baked often bungs with my grandma.*

Besides purely grammatical structural errors the compositions also showed that the dyslexics made quite a many stylistic errors as well. In some compositions the sentences were structured fairly simply and they contained a lot of repetition, like this fragment from one composition shows: *I read book book whose name is Bridget Jones’s diary. Book’s writer is Helen Fielding. Bridget Jones's diary is Helen Fielding’s second book. Book was published first time in 1996. Editions is published many because this book is very popular. Book is not abridgea or simpfied.*

### 8.3.4 Prepositions

Because Finnish uses inflectional endings instead of prepositions and because one English preposition may have many meanings, using prepositions and choosing the right one seemed to be problematic for the dyslexic students. Most often the students forgot to use the preposition *to* before verbs e.g. *I like make food and bake; we didn't want eat; now he want die*, or used prepositions when they were unnecessary, e.g. *I watsing to the TV; I liked to the shotr story...; students, who visited in Germany last summer...*. The preposition *of* was also very problematic as it often is a part of a phrase or an adjective and is thus easily left out e.g. *...mohter scared hers son; Lestat is tired be a vampire; ...locked some their teachers in closet; It young man can a lot special words.*
Surprisingly, many of the students did not remember to use the preposition *in*, even though the corresponding inflectional ending (-ssa) would be used in Finnish as well, e.g. *I live fantasy words and walk hear in clouds; Italy we would go to Rome; Maybe some girls needs racing skills future*. All in all, many of the errors in this category were caused by choosing the wrong preposition, often because of the interference of Finnish inflectional endings e.g. *...the puppy was sitting at the floor; Later we would have barbeque with our friends on our summer house; Miss Bird comes and shouts to him*, or by forgetting to use any preposition at all, e.g. *How could wake up me this sleeping?; ...teacher cat hit studend about pointer; ...because you don’t need write pensil on the paper.*

8.3.5 Ungrammatical and inconsistent use of verb

Using different tenses and working with the rather complicated verb structures of English seemed to be rather difficult for dyslexics. Quite often the dyslexics forgot to use the past tense forms of the verbs when they wrote about something that had happened in the past, e.g. *When I was child I like also wash the dishes; ...once I was trap in city 3 hours because I borrow my buscard; ...allthought at first I didn’t understand what it is about*. This may be because finding the right words takes the concentration away from the structure or because the ending –*ed* is not pronounced very strongly and is thus easy to forget.

The complicated verb structures were obviously very difficult for the dyslexic students. Especially conditional clauses, passives, the perfect tense and *if*-clauses were often written incorrectly. Many of the errors showed, however, that the writers were often conscious of certain structures and how to build them and were, in fact, able to use parts of them, but trying to fit additional structures into the same sentence seemed to be too much for them e.g. *Many persons would be surely taken money and left to flight if they would have been Nick... I don’t would have taking to money. I would have explain garages to seller situation; If you did something wrong, you get detention; Old women be able to very little*
words and I forced to help them; But there is something what have to do to the youngbikers.

Sometimes parts of the verb structure were missing, probably because the rest of the sentence caught the attention of the writer and the words were simply forgotten or because the writer was not aware of the structure or did not remember all of it, e.g. ...but I haven’t hobbies ofcorse; Ages should not increased...; ...all food had to eaten; ...pupils almost scared their teachers.

Using and forming different tenses and tense structures was also problematic for the dyslexics. In many of the compositions there was clearly confusion of when to use the progressives and when not e.g. I training over five hour in a week; I watchin all time any box; Claudia, who is dead, but haunting in Lestats dream. In the past tenses the biggest problems were remembering how to conjugate irregular verbs, e.g. My brother begun to spin the cheesebag; ...when all lakes are freezed; ... they stole and hide my shoss, choosing the right auxiliary verb and knowing when to use it e.g. I have born...in Tampere; I was always liked make food and bake; ...and starts to read book like nothing was happened, as well as using the right forms of all the different parts of a verb structure, e.g. I have been working in many places where are I have make food; ...and everybody else have been learned earlyer; ...like we did have in Germany. Difficulties in working with these complicated verb structures could also be seen in the fact that there were some sentences where the writer had possibly been distracted and had used two verbs in the same sentence, e.g. You and my brother are were very important to me; ...if boys is be interested in, as well as in the fact that some writers had created entirely new forms and meanings for some verbs, e.g. our father musted make food for us; ...and then photo seems to television; or even used another language in their compositions e.g. But we would inte go to seen all churcher and museums.
8.3.6 Self-made words

Besides spelling, using the right words in the right context was difficult for the dyslexic students. This category does not only contain words that are self-made and do not exist in English but also real words that do not fit the context of the sentence.

In many of the compositions it was obvious that the writer had been using a dictionary while writing the composition as there often were words that just weren’t the right choice for that particular sentence but whose meaning was quite close the right one e.g. *After friends visiting we would be together sitting on the dock...*; *This noise can be revolting;...beavers are one part of our comprehensive nature; In my opinion your thoughts are absolute.* Most of the mistakes in this category were caused by using a word the meaning of which did not quite fit the sentence. Very often the meaning of the chosen word was quite close to the right one, e.g. *...and have a beautiful wedding and handsome man (husband); very little (few) words; ...or hate that dummy (silly) game, or from the same semantic field but with the opposite meaning e.g. Solicitor would buy (cost) indeed quite a lot.* In some cases the interference of Finnish words was easy to see e.g. *...and gave this student good numbers (grades); She keep (considers) herself ugly; The film I looked (watched)...; ...you don’t have to get (have) children; The story happened (took place) in Miami.* Finnish interference could also be seen in a number of words that the writers invented themselves e.g. *write type – handwriting; overspeeding – speeding; school houers – lessons; yester year – last year; flowerly backpacks – flowery backpacks; familyliving – family life.*

The students also created new English words using the same rules by which you create new words in Finnish, e.g. *message send – sending messages; money taking – taking the money.* There were also a couple of words in the compositions that were entirely self-made. Some of them resembled the words that probably were the ones that the writer had intended to write, such as *...they ounly take me advandabe (take advantage of me); school
hours and aktivet (activities); When (will/can) you help me, but one of them could not be understood at all, e.g. ...cos her has dipfaissed.

8.3.7 Congruence

Even though English only has a couple of finite forms for verbs compared to the dozen in Finnish language, remembering to use them with the right noun forms is rather difficult for Finns, let alone for dyslexics. Thus it is not surprising that the most mistakes (51,4%) in this category were made by forgetting to use the ending –s in the verb with nouns in 3rd person singular form, e.g. ...if he want; she go to new school; ...it don’t matter; ...world have changed. The different forms of the verb be and when to use them were also difficult for the dyslexics. Most often they used the singular forms is/was with plural nouns, e.g. icy strawberries is very good; Her parends is happy; The letters is very slow system; ...backpacks was fashion, but in a couple of cases the writer had used the plural form with a singular noun e.g. Discipline in school were very hard; Lenght of school days were as long as novadays...; Then there are this my ounly friend....

8.3.8 Nouns

The category of nouns contained all the errors made with the use of the singular and plural noun forms, the genitive forms as well as the confusion of nouns with other word classes. The dyslexic students made the most errors (25,4%) in the use of the genitive forms by not remembering to write the apostrophe before the ending –s, e.g. Stephen Kings, mothers, scouts. This is quite understandable as you can not hear the apostrophe in speech; you just have to remember to write it. The students also made errors with the singular and plural forms especially when there were quantifiers, numerals etc. in the phrases e.g. many person, a few bad memory, first four year, First days was just illusion...; every affections is esteemed; one of my favourite writer; this courses, but especially plural nouns that do not end in –s were often
written incorrectly e.g. *For other peoples of your home sofa; I hope that I will get husband and childrens; ...all women’s were just screaming.*

The uncountable nouns were problematic for the writers, as well. Some of these mistakes can be explained by Finnish interference, e.g. *We must reduce pollutions...; She got only one detention*, but some are probably caused by not thinking about the actual meaning of the word and using the same form as with other similar looking words, e.g. *Tunamess includes tunas, crushed tomatoes, mashed potatoes powder and rices.* To my surprise there were only a few words that the writer had incorrectly used as a noun (*...important to all of Finnish; Art and sing were very important subjects; Bake is very nice with children*).

**8.3.9 Pronouns**

This category contains errors in all pronoun types as well as in the use of introductory *it* and *there*. The dyslexics were quite confused with the different personal pronoun forms. They did remember to use the pronoun in the right person but the case was often incorrect e.g. *...instead of he own feelings; ... and she clothes are usually blue; ...our should be satisfied that, what we have; ...with mine conscience*. Only one student used the wrong plural person but the right case in his/her compositions, e.g. *...you have to think only ourself; ...you have our own time...*, probably because the forms *our/your* look so similar. The use of the non-personal pronoun *it* was very problematic for the dyslexics, as well. In most cases this could be explained by Finnish interference, *you have made (it) possible me to live easier; I don’t undersdant (it), Boys like (it) when girl has some extreme and unusual hobby; ...people who don’t like (it) or hate that dummy game*. Surprisingly, the dyslexics made only a few mistakes with the use of introductory *it* and *there* (e.g. *Normally in sauna is 100-120 grades; Today is also many television chats*). This is quite surprising because the same structure does not exist in Finnish and thus one might expect it to be difficult to use it, and in many of the compositions the structure was used correctly.
8.3.10 False idioms

Because there were no pure idioms used incorrectly in the compositions and because there were many incorrectly used idiomatic and fixed expressions as well as phrasal verbs that did not quite fit any of the categories I decided to include them in this one. This category thus includes all kinds of phrases, phrasal verbs and idiomatic and fixed expressions that need specific prepositions, articles or other words with them, such as *a lot of*, *five times a week*, *as common as*, *to keep in touch*, that were used in the wrong context or were written incorrectly. Idioms and idiomatic phrases and fixed expressions are very difficult for language learners because they often consist of parts that do not carry meaning themselves or the meaning of the parts does not reveal the true meaning of the idiom. Because of this idioms and idiomatic phrases are something that you have to learn by heart and know in which contexts to use them. The errors in this category showed that the dyslexics were aware of many idioms and idiomatic phrases but confused them with other ones and often forgot parts of them.

The dyslexics made the most mistakes with the determiners expressing amount e.g. *There were is lot of people; There is a lot historical monuments; I was little nervous; few times they even beat me up*, and frequency e.g. *once of the month, two time the week, four hours all day*. In addition to these, comparative phrases were often written incorrectly and were usually a combination of different comparative phrases, e.g. *letters are more romantic as, classrooms were similar than today; so long that (as long as)*. Other errors in this category were for example, *but other hand (on the other hand); and other way (the other way round)*; *pupils almost scared their teachers (pupils were almost scared of their teachers); we had a very fun time; There book might have been a few slang words expressions, because I haven’t come up with (bumped into) such words before; maybe my future job brings on food.*
8.3.11. Incomprehensible sentence

In the category of incomprehensible sentences I included sentences that had so many mistakes, both spelling and grammatical mistakes, that understanding what the writer wanted to say in them was extremely difficult or even impossible even in the given context. The amount of these sentences was fairly low (25 sentences) but almost all of them were in the compositions of the students who suffer from severe dyslexia. Some of the sentences in this category were not entirely incomprehensible but then again, the true meaning of the sentence remains rather unclear and the possible meaning is just my guess e.g. If I liked watched the game I don’t really get the rules of this game (Even though I like watching the game I don’t really understand its rules); I little worked up because son’s behavior it was horrible towards his mother (I’m a little angry because...).

The majority of the sentences of the compositions were thus entirely understandable and in the rest of them there were only a sentence or two that were incomprehensible because of poor choice of words or because of there were words missing e.g. I hope that I clarify at last that course. I would like to learn English, but all that I feel quite futile; In my opinion girls and boys can be interested in touching only want. I don’t understand touching harmful boys is be interested in for example arts [...] It is not the youngsters to go extreme to another but at present we are be able to choose hobbies freely regardless others’ opinion.

For the students with severe dyslexia finding the right words and spelling them correctly, using them in the correct form as well as using articles, prepositions and other small words, and remembering to use the sentence structure of English at the same time seems to be extremely difficult, as can be seen from the following fragments. This first fragment is from a composition titled Am I addicted to television?:

I watchin all time any box, but this box is singer, spoken and make happies. I live fantasy words and walk hear in clouds How could wake up me this sleeping? Everybody as nobody? I thins anyhtings, but I cannot make. When you helpe me?
New life start this day and school. School is very big and afraid to in. She boring live to end. She star hobbies football and she loves her new school [...] She know very good in to school and her parens help her if she not get her homework stopping in the stool. She see words nu beautiful as yester year. I littel work is as big happy in her life. She wakes up 6.30 morrong and go to school. Her parends is happy sheself. Something she angst but don’t all happy.
9. Discussion

In this chapter I will look more closely into what are the main reasons behind the errors in producing written texts in English as a foreign language for dyslexic students and discuss which areas or structures seem to be especially difficult for them.

Compared to the amount of the compositions from each student the amount of mistakes in the different categories was surprisingly even, taking also into account that the severity of the disorder among the students varied from mild to very severe dyslexia. The categories with the most mistakes were articles, spelling, sentence structure and prepositions. There were only a couple of categories in which some of the students had made on average slightly more errors than the other ones. These categories were (11) sentence structure and (4) nouns. After analysing the errors I came to the conclusion that the students who had made the most mistakes in the sentence structure were the ones who suffered from severe or very severe dyslexia. The higher number of errors in the category of nouns in the compositions of one student could be explained by the fact that the compositions where the majority of these errors existed were quite long (268-466 words) and the same errors recurred in the same composition again and again.

All in all, the results of the study showed that there were a couple of reasons that seemed to cause the errors in many different categories: Finnish interference, pronunciation and working with foreign structures and words in general. Finnish interference caused errors in almost every category. Mostly the mistakes were caused by forgetting to use structures that do not exist in Finnish, e.g. forgetting to use articles before nouns, the preposition to before verbs or the non-personal pronoun it. The effect of Finnish on the texts could, however, be seen especially in the categories of sentence structure, prepositions and self-made words. The sentences were very often structured according to Finnish grammar and because the students with severe and very severe dyslexia made slightly more mistakes with sentence structure one could say that the dyslexics do have more difficulties in organising their thoughts into another
language as well as in remembering and using the different word order and grammar rules of English.

Most of the errors in the use of the prepositions were also caused by Finnish interference. In some cases the student had chosen a preposition which corresponds with the Finnish inflectional ending in some contexts but which was not the right choice in that one. Difficulties in understanding that the prepositions correspond to the Finnish inflectional endings as separate units before the actual meaningful words was probably the reason why the students had forgot to use them entirely in some cases. The dyslexics also created new words according to Finnish grammar rules and used words that were directly translated from Finnish but whose meaning did not fit the sentence. Without having a Finnish non-dyslexic comparison group it is rather difficult to say whether the errors are typical for Finnish students or whether they are even more typical for the dyslexics.

Another significant reason behind the errors was the pronunciation and phonology of English. The majority of the spelling mistakes were caused by writing the words according to their pronunciation but besides this the weak pronunciation of some words and structures may have been the reason why the students forgot to use for example the article a in the expression a lot of, the ending –ed with verbs in the past tense or the ending –s with verbs in the 3rd person singular. In a wider scale, however, it seems that the main difficulty for the dyslexic students is to work with foreign word order, foreign structures and foreign words as well as with the ideas that they want to express in their texts all at the same time. In many categories it was easy to see that the students were aware of certain structures and were able to use some of them or parts of them but if the same sentence demanded for example the ability to use complicated tense structures as well as idiomatic phrases the result was often that parts of the structures or entire words were missing from the sentence. The unnecessary use of some complicated structures and the incorrect use of structures that are the same in Finnish revealed
that the students had difficulties in understanding the meaning of the structures and when to use them as well as finding similarities between the languages.

Based on the results of the empirical study I would say that the areas that cause difficulties especially for dyslexic students in producing texts in English as a foreign language are the ones that are affected the most by Finnish interference, pronunciation and working at the same time with many different foreign structures in general, and according to the results these areas are spelling, sentence structure and verbs.
10. Conclusion

Dyslexia is a disorder that affects a person’s skills to operate with language and linguistic material in general. At the moment it is thought that the disorder is caused by genetic mutations or environmental factors that affect the structure of the central nervous system and cause it to function defectively. Even though researchers identified dyslexia already at the end of the 19th century and it has been studied carefully well over a hundred years studying the disorder has been very difficult because it is a very versatile disorder and affects different people very differently.

Despite the complexity of the disorder and the fact that it manifests itself very differently from person to person some general tendencies could be drawn from the results of my empirical study and more over those results lend support to the earlier studies on dyslexia and foreign language learning by Opas and Paloheimo-Pikkarainen, Viskari and Huopalainen and Ruuttunen. Based on all the studies mentioned above it seems that spelling, pronunciation, foreign grammatical structures and difficulties in seeing similarities between English and Finnish are the main areas that cause the most difficulties for dyslexic students in learning English as a foreign language.

The results of this empirical study and Opas and Paloheimo-Pikkarainen’s study are notably similar. Both studies come to the conclusion that the four of the five areas that are the most problematic for Finnish dyslexic students are spelling, articles, inconsistent and ungrammatical use of verbs and prepositions. Opas and Paloheimo-Pikkarainen state, however, that the non-dyslexic comparison group made the most errors in the same categories, but based on all the above mentioned studies one could say that these categories are even more problematic for dyslexic students. Interviewing students with and without dyslexia could also reveal whether the students themselves feel that these specific areas or structures are especially difficult for them to understand and to use or whether they are
unaware of their mistakes and difficulties or consider some other areas or structures more difficult than these.

The difficulties in spelling and pronunciation are mainly caused by the poor grapheme-phoneme correspondence of English and problems in understanding the difference between the written and spoken forms of words. The dyslexics tend to write words according to their pronunciation and in addition to this the correct spelling of voiced and voiceless consonants, doubled consonants as well as the different s-sounds of English seem to be problematic for them. In addition to this the dyslexics also tend to pronounce words according to their written form which makes oral communication very difficult. Because of this more attention should be paid to the teaching of these different forms of words already at the beginner’s level. This study concentrated only on written texts and on the difficulties that dyslexics have with written production. In the future it would be thus interesting to study the other areas of language learning as well and to find out what kind of difficulties dyslexic Finnish students learning EFL have, for example with pronunciation or listening comprehension as the different pronunciation as well as the different sounds clearly affected their spelling. It would also be interesting to know whether a special focus on teaching pronunciation, on the quality of the sounds and on the place of pronunciation, would help them to understand spoken English better and also to spell words correctly.

The difficulties in understanding the different grammatical structures of English and using them in practice seem to be caused by difficulties in understanding the function and use of the grammatical rules. The dyslexic students may know many separate grammatical rules by heart but they do not know when and how to use them in their own production. These difficulties may also be caused by difficulties in learning the grammar of Finnish as well as by problems in finding similarities and differences between the structures of Finnish and English. Because of this special attention should be paid to the Finnish teaching of the dyslexics as well as to the careful teaching of the function of different grammatical structures, perhaps
with the help of a method that concentrates more on teaching grammar in real life contexts so that their function becomes clearer.

As a conclusion, Finnish dyslexic students learning English as a foreign language have the most problems in written production with structures that are affected the most by Finnish interference and foreign pronunciation and which require the ability to use different structures simultaneously. These problems seem to be caused by difficulties in understanding the differences and similarities between English and Finnish structures and their functions as well as because of the poor grapheme-phoneme correspondence of English.
11. Bibliography


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