Morphological Awareness Skills of Norwegian Adolescent Dyslexics Acquiring English as a Second Language

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"Canım anneciğim, canım babacığım, biricik kardeşim Sedef, ve aşkım hayatım Frank, bu tezi size armağan ediyorum. Bütün desteğiniz ve sevginiz için çok teşekkürler. Sizi çok seviyorum."

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PART III: *Closing Remarks*

General Introduction

Literacy is undeniably essential in modern society. Moreover, becoming literate in at least one other language is equally important for many individuals. In this thesis we will take a close look at a language-based learning disorder which poses a life-long problem with acquiring literacy skills, namely dyslexia. Our primary focus will be on dyslexia in individuals acquiring a second language.

A long line of research has demonstrated that phonological awareness skills, including the ability to segment speech into smaller units such as syllables and phonemes, are related to reading outcomes and are deficient in individuals with dyslexia. Although the precise nature and origin of dyslexia are still in debate, results from these studies have led to a fairly large consensus for ascribing literacy problems in dyslexics to a phonological dysfunction (Bradley and Bryant, 1983; Deacon, Parrila and Kirby, 2006; Siegel, 2008; Sprenger-Charolles, Colé and Serniclaes, 2006). However, in addition to phonological processing skills, other linguistic abilities have also been reported to exert some influence on reading achievement in dyslexic individuals. One of them is morphological awareness ability, which is defined as sensitivity to morphemes in words. This ability is, for example, to know that the word *unacceptable* consists of three meaningful segments (i.e., morphemes) and the meaning of the whole word is the product of the combination of these morphemes: *un-accept-able* (Casalis, Colé and Sopo, 2004; Siegel, 2008). Contrary to the research on phonological awareness skills, most of the studies on morphological awareness have focused on older children, indicating that morphological awareness is related more to identification of complex words and to comprehension processes than to early reading development (Windsor, 2000).

Morphological awareness skills, in particular awareness of derivational morphology, have been shown to be strongly associated with reading achievement (i.e., word-level reading and reading comprehension) in both dyslexics and non-dyslexics (e.g., Carlisle, 2000; Mann and Singson, 2003; Nagy *et* al., 2003). There is also considerable evidence that dyslexic individuals have poorer morphological processing skills in comparison to their chronological-age peers (e.g., Carlisle, 1987; Champion, 1997; Leong, 1999; Tsesmeli and Seymour, 2006). Although recent research findings in the field of dyslexia point to a relation between reading-related skills and morphological and phonological abilities, the relative importance and

contribution of these two linguistic skills to reading outcomes remain a matter of debate. Some researchers argue that poor readers' weakness on morphological awareness tasks might be caused by their deficient phonological abilities, and therefore, that the role of morphological awareness in reading is secondary to phonological abilities (e.g., Fowler and Liberman, 1995), while others suggest that the relationship between morphological awareness and reading is neither dependent on nor a derivative of phonological abilities. The proponents of the latter view also argue that the importance of morphological awareness skills to reading increases with age and grade level (e.g., Deacon and Kirby, 2004; Singson, Mahony and Mann, 2000).

Motivated by the findings of the studies discussed above, we will in this thesis attempt to investigate the morphological and phonological awareness skills of a group of Norwegian high school students with dyslexia. We will also examine the relationship of these two linguistic abilities to students' reading comprehension skills to see whether we might be able to find some evidence in support of the two arguments reviewed above. Based on previous research, it has been argued that older students with dyslexia might have better morphological awareness skills than younger dyslexics due to their greater exposure to English. This is the main reason why we have decided to focus on high school students in the current study.

To this end, we have compared the performance of a dyslexic sample to that of a chronological-age matched control group on three language and literacy tests in English: A morphological awareness test consisting of two subtests on derivational suffixes (the real-word and the pseudoword tests), a phonological awareness test based on phoneme and syllable deletion, and a reading comprehension test comprised of nine texts followed by multiple-choice questions. Results reveal that the dyslexia group in general do considerably worse than the control group on all the tasks administered in the study. However, results also indicate that, compared to controls, dyslexic participants exhibit a much larger within-group variation in terms of their accuracy on the tests, supporting previous findings that cognitive abilities of these students could be affected by dyslexia to considerably varying degrees (Crombie, 2000). As for the relationships between reading comprehension performance and morphological awareness vs. phonological awareness skills, the present results suggest that reading comprehension skills are more closely related with morphological awareness than with phonological awareness in both the dyslexic and the control group, lending support for a stronger association between morphological awareness and reading comprehension than

between phonological awareness and reading comprehension, as proposed by, among others, Carlisle (2000); Deacon and Kirby (2004), Siegel (2008).

Another noteworthy result of this study is that, even though the participants with dyslexia fail on the tasks to a greater extent than their typically achieving counterparts, both groups seem to exhibit a somewhat similar pattern of performance in terms of the errors they make on these tests, suggesting that in general, dyslexic subjects' errors on the test items differ quantitatively rather than qualitatively from those of their typically developing peers. However, it should be noted that, although the current findings appear to provide us with some insight pertaining to the performance pattern of the students who volunteered to participate in this study, they may not generalize to other populations, either dyslexic or non-dyslexic, due to, among other things, the relatively small sample sizes used in the study.

The thesis is structured in the following way: Chapter 1 starts with an introduction (section 1.1) and elaborates on dyslexia by giving the operational definition of it used in this work (section 1.2), by presenting the current views as to the possible causes of this disorder (section 1.3), and by discussing whether there are any dyslexia sub-types (section 1.4). Chapter 2 deals with second language acquisition in dyslexia and starts with an introductory section (2.1). It highlights a number of language problems that students with dyslexia experience in acquiring a second language (section 2.2), then discusses a hypothesis which proposes an account for these problems (section 2.3), and provides a detailed discussion as to whether dyslexia may manifest itself differently in different languages (section 2.4). Chapter 3 is concerned with some of the current assumptions made regarding the role of morphological and phonological awareness in reading comprehension. Section 3.1 is an introduction. Section 3.2 provides a definition of reading comprehension; section 3.3 discusses how phonological awareness skills can affect reading comprehension performance of individuals with and without a reading disability; section 3.4 tries to provide an account of the relationship between morphological awareness and reading achievement; and section 3.5 discusses whether dyslexics' deficient morphological processing skills in comparison to their normal-age peers. In chapter 4, the objectives of the current study are formulated, and in line with those objectives two main hypotheses are proposed. Chapter 5 outlines the methodology of the study. It provides information concerning the official permissions that were obtained before commencing the experimental part of the study (section 5.1), and then it introduces the participants who volunteered to participate in the study (section 5.2). It also describes the tests (section 5.3) and

the procedure of the study (section 5.4). Chapter 6 presents the results of the current study while chapter 7 analyzes these results and compares them with the findings of similar studies. Finally, chapter 8 summarizes the thesis reported here and ends with a brief section on the limitations of the study and the suggestions for further research (section 8.1).

PART I: *Background*

1. DYSLEXIA

1.1 Introduction

This chapter

- gives an operational definition of dyslexia used in this work
- elaborates on the possible causes which may lead to dyslexia
- discusses whether there are any sub-types of dyslexia.

1.2 What is dyslexia?

It is now over a century since dyslexia was first reported in Britain and described as "congenital word blindness" (Snowling, 1989). However, despite years of research there is no consensus on the definition of dyslexia and its underlying cause (Smythe and Everatt, 2002). It is safe to say, though, that converging evidence indicates that dyslexia is a language-based learning disorder which is generally associated with reading, spelling and writing difficulties. It is independent of socio-economic or language background, and occurs despite normal intellectual ability and conventional teaching (Cline, 2000; Peer, 2001; Schneider and Crombie, 2003; Been and Zwarts, 2004; Moats and Dakin, 2008). Nevertheless, it is worth noting that dyslexia is defined slightly differently by professionals in different countries. For example, while the term dyslexia is used to refer to both reading and writing difficulties in the United Kingdom, in Russia it is used to describe not spelling and writing problems, but reading problems only (Smythe and Everatt, 2002).

In the literature on dyslexia we can find numerous definitions which characterize dyslexia as a language-based disorder. Therefore, it is important to state clearly the one used in this thesis. The definition I adopt is formulated by Smythe and Everatt (2002, p. 73). It incorporates many of the key features identified by recent research in diverse monolingual and multilingual environments:

> Dyslexia is a difficulty in the acquisition of literacy skills that may be caused by a combination of phonological processing and visual and auditory system deficits. Lexical confusions and speed of processing difficulties may also be present. The manifestation of dyslexia in any individual will depend upon not only individual cognitive differences, but also the language used.

As may be inferred from the definition above, it is necessary to consider a variety of cognitive, visual and other factors when determining potential causes of dyslexia. While such factors leading to literacy difficulties are better understood in the English language, they are far less understood in other languages (Smythe and Everatt, 2004). This is due to the fact that about two-thirds of all published research on dyslexia is carried out in English-speaking countries (Nergård-Nilssen, 2006a). In what follows, I try to elaborate on the main hypotheses suggesting theoretical explanations of dyslexia.

1.3 Origins of dyslexia

Familial transmission of dyslexia and the significant genetic risk have both been known for almost a century. Thus, the fundamental cause is suspected to be genetic in origin (Been and Zwarts, 2004). On the other hand, as highlighted by Marinac (2008) "(…) at present, no study has determined that dyslexia is the inevitable result of genetic inheritance" (p. 25). Therefore, as yet, the data gained in genetic investigations do not seem to be sufficient, albeit invaluable, in explaining dyslexia.

According to Mortimore (2008), there are currently three main explanatory theories as to the causes of the dyslexic patterns of difficulty; (a) The phonological deficit hypothesis (PDH), (b) The magnocellular deficit hypothesis (MDH), and (c) The cerebellar deficit hypothesis (CDH). He points out that "(…) they have all emerged from research into the reading process, which still exerts a strong influence on dyslexia theory" (p. 52). Among these hypotheses, the PDH has been the dominant descriptive framework for dyslexia during the late twentieth century (ibid.).

Based on the fact that the majority of dyslexics have severe problems with constructing, maintaining, and retrieving phonological representations owing to their lack of sensitivity to the sounds in words, the PDH proposes that reading problems of dyslexic individuals stem

from the difficulties that they have with phonological processing (de Bree, 2007; Nicolson and Fawcett, 2008). An influential proponent of the PDH, Snowling (2000, pp. 34-35) maintains that phonological processing skills in dyslexic children are selectively impaired, while other aspects of their language are relatively intact. Accordingly, many children with dyslexia are able to use language well for communicative purposes but have subtle difficulties with speech processing, which hinder the acquisition of written language skills. Sprenger-Charolles, Colé and Serniclaes (2006) agree with Snowling and state that poor phonological skills, in particular, "(…) deficits in phonemic awareness, as well as phonological short-term memory, can explain the reading deficit of dyslexics. (…) Thus, dyslexia may be rooted in a specific cognitive deficit that is phonological in nature" (p. 134).

Before proceeding any further, it is necessary to clarify the following terms as they will be used throughout the thesis: Phonological awareness and phonemic awareness. In the literature, the first term has been used as an umbrella term to refer to a wide range of skills involved in discriminating, manipulating or otherwise responding to the sounds of speech. On the other hand, phonemic awareness refers to the ability to segment and manipulate the smallest units of speech sounds (i.e., phonemes) within words. This conscious recognition of individual phonemes is thought to be one of the component skills that contribute to overall phonological awareness. In other words, phonological awareness implies a more general level of awareness than phonemic awareness. Three separable components underlying phonological awareness have been identified: syllable awareness, onset-rime awareness, and phoneme awareness. Compared to syllable awareness and onset-rime awareness, the ability of phonemic awareness appears to develop later in children. It has been argued that dyslexics have severe difficulties in segmenting speech sounds at these three levels, especially at the phoneme level (Beaton, 2004; Blachman, 1997; Gelzheiser and Wood, 1998; 2004; Muter, 2006; Zeffiro and Eden, 2000; see also Adams, 1990, for a comprehensive discussion of phoneme awareness). Here, it should be noted that there is not complete agreement between investigators about the exact nature of phonological awareness; however, this issue falls outside the scope of the current work.

The assumption that a deficit in phonemic awareness is a universal phenomenon responsible for reading problems has been challenged by two studies conducted by Landerl and Wimmer (2000). They criticize the fact that most of the studies which lend support for a phonemic awareness deficit in dyslexia have been done with English-speaking dyslexics. In their study,

they evaluate the performance of English and German dyslexic children on a variety of tasks, including phoneme segmentation. On the basis of their findings, they argue that phonemic awareness is not completely absent in German dyslexic children. Furthermore, their results suggest that "(…) in the context of a consistent orthography (…) deficits in phoneme awareness are only evident in the early stages of reading acquisition, whereas rapid naming and phonological memory deficits are more persistent in dyslexic children" (p. 243). They also argue that "these early difficulties may be more transient than they are for English dyslexic children due to the benefits of a more transparent orthography" (p. 257). Moreover, in a single case study carried out by Castles and Coltheart (1996) it is proposed that phonological deficits may not be the cause of all reading problems in dyslexics. Interestingly, the question as to whether dyslexia may show itself differently in various languages appears to be the subject of many recent studies, at which we will take a closer look in section 2.4.

Although the PDH has remained the core explanation for the literacy problems associated with dyslexia, alternative theories, such as the MDH and the CDH, were proposed during the 1980s and in the early 1990s (Mortimore, 2008). The MDH claims that the literacy difficulties might arise in the magnocellular system – tracts of large neurons in the eye, while the CDH assumes that such difficulties arise in the cerebellum – a sub-cortical brain structure involved in sensorimotor movements (Nicolson and Fawcett, 2008). Nonetheless, these theories are more controversial and not widely acknowledged compared to the PDH, as expressed by Frith (1999, p. 203-204):

> It seems to me that, unless they [the MDH and the CDH] provide evidence against the relationship between learning to read and phonological capacity, they too need to incorporate an explanation of a phonological deficit. However, they might postulate more general deficits, e.g. deficits in processing sequences, from which a phonological deficit might be derived.

Bearing these arguments in mind, we can conclude that at present the origin of dyslexia is a controversial issue for dyslexia scholars. However, among the theories reviewed above, the PDH, which proposes that phonological factors are the main causes of dyslexia, seems to be agreed by most experts in dyslexia research.

1.4 Are there subtypes of dyslexia?

In spite of the common characteristics of dyslexia, such as problems with verbal short-term memory, and difficulties with the retrieval of phonological information from long-term memory (Snowling, 2004), the severity of dyslexic learning disabilities will be determined by individual differences in cognitive areas. That is, dyslexics form a heterogeneous group of individuals with different patterns of strengths and weaknesses (Schneider and Crombie, 2003). This fact has given rise to the question of whether there are sub-types of dyslexia.

A study done by Castles and Coltheart (1993) has attempted to classify dyslexic children according to their reading patterns and maintained that there exist two distinct varieties of developmental dyslexia: *developmental surface dyslexia* and *developmental phonological dyslexia*. These two varieties are similar to subtypes found in acquired dyslexia, which is the loss or partial loss of the ability to read as the result of illness, accident or brain surgery (Field, 2004).[1] Castles and Coltheart have characterized the first sub-type by a deficit in whole word recognition and the second by a deficit in letter-to-sound rules. According to this classification, surface dyslexics have trouble pronouncing irregular words (e.g., *yacht* as /yætʃt/) while phonological dyslexics can not read non-words (e.g., *fot*), but can read irregular words. They have also noted that this close examination of the symptom patterns in dyslexic children has helped to answer many of the questions about the varieties of developmental dyslexia. As a result of this, they claim the following: "That there do exist distinct varieties of developmental dyslexia, and that these varieties are relatively prevalent in the developmental dyslexic population, seems difficult to refute" (pp. 176-177).

At this point, we may ask whether it is valuable to categorize dyslexics as surface and phonological. Manis and Bailey (2008, p. 171) articulate a similar idea to that of Castles and Coltheart (1993), viz., "[i]t is our opinion that this enterprise has served its purpose (highlighting individual differences among dyslexic children)", whereas Snowling (2006, p. 8) strongly disagrees with such classifications of children with dyslexia on the grounds that "all taxonomies leave a substantial number of children unclassified", and concludes that it is not useful to put dyslexics into subtypes. In a nutshell, the fact that people with dyslexia exhibit individual differences is not denied by dyslexia researchers, but the existence of

[1] Since acquired dyslexia is not within the scope of this thesis, only the terms "dyslexia" and "developmental dyslexia" are used interchangeably here.

distinct subgroups in developmental dyslexia is currently a controversial issue in dyslexia research, and consequently, there is need for further studies.

1.5 Summary

Although there is no agreed-upon definition of dyslexia among researchers, converging evidence indicates that dyslexia is a language-based learning disorder which is generally associated with reading, spelling and writing difficulties. It has been known for many years that dyslexia has a genetic origin. However, data from the genetic investigations do not appear to provide a full account of dyslexia yet.

There are currently three main theories as to the causes of dyslexia and they have all emerged from research into the reading process; (a) the phonological deficit hypothesis (PDH), (b) the magnocellular deficit hypothesis (MDH), and (c) the cerebellar deficit hypothesis (CDH). According to the PDH, reading problems of dyslexic children stem from a deficit in their phonological processing skills. The MDH claims that literacy difficulties might arise in the magnocellular system, while the CDH assumes that such difficulties arise in the cerebellum. Among these hypotheses, the PDH has been the dominant descriptive framework for dyslexia during the late twentieth.

Despite the fact that most dyslexics suffer from similar problems, such as difficulties with verbal short-term memory or problems with the retrieval of phonological information from long-term memory, the severity of dyslexia will be determined by individual differences in cognitive areas. This fact has given rise to the question of whether there are any sub-types of dyslexia. While some researchers maintain that there do exist distinct varieties of developmental dyslexia, other researchers disagree with such classifications of dyslexics.

2. SECOND LANGUAGE ACQUISITION in DYSLEXIA

2.1 Introduction

This chapter aims to

- highlight a number of language problems that students with dyslexia experience in acquiring a second language
- refer to the so-called Linguistic Coding Differences Hypothesis which proposes an account for these problems and presents alternative intervention strategies in the second language teaching of students with dyslexia
- review the findings from recent research which pose challenges to this hypothesis.

2.2 Common dyslexic difficulties in second language acquisition

Today's world with its increasing global challenges demand that both children and adults learn at least one foreign language, and in this context individuals with developmental dyslexia are no exception. However, acquiring a second language can provide a challenge to dyslexic students, due to the nature of the disability itself, as discussed in the previous chapter.

As mentioned earlier, dyslexics do not represent a homogeneous group of underachievers, and therefore, the specific language difficulties they have should be seen within a continuum from mild to severe. Research has shown that the exact nature of these problems may vary, depending on the degree of dyslexic difficulties as well as the language being acquired (Crombie, 2000). However, dyslexics may have very distinctive weaknesses in tasks which involve language learning (Crombie, 1997).

The dyslexic problems which seem to affect the learning of another language include difficulties decoding, encoding and comprehending print at the levels of letter-sound, morpheme (prefixes, roots, suffixes with grammatical or semantic information), and syntax. Short-term memory problems also play a major part in students' poor written and oral

language performance (Schneider, 2009). Hence, they might have problems becoming aware of the sound structure of foreign words (viz. phonological awareness). Due to this lack of awareness, they might be unable to distinguish between words in the foreign language. Their poor understanding of grammatical structures and morphology of a foreign language, together with a weak working memory, may result in difficulties remembering and applying spelling and grammar rules and 'parsing' spoken language. Consequently, these problems might make it difficult for the dyslexic students to develop a satisfactory interlanguage (Dal, 2008; Ganschow, Schneider and Evers, 2000; Simon, 2000). It is also noteworthy that dyslexics often fail to develop metalinguistic awareness of their oral and written language. In other words, they make the same errors over and over again, since they lack the awareness to recognize their own errors (Schneider and Ganschow, 2000).

Regarding the question of how the learning characteristics of students with dyslexia differ from those of their classmates, Simon (2000) reports on two studies done by Michaelides (1990) and Lescano (1995). The results obtained from this research suggest that for most of the students learning English as L2, the main source of error is a temporary interference from the mother tongue (e.g., word order). However, for students with dyslexia, interference seems to persist for a prolonged period of time and may never disappear. Also, these students tend to have perception difficulties and they often ignore details (e.g., plural forms) in spoken and written language. Instead of focusing attention on linguistic details, they seem to focus on overall comprehension and production in both their native language and English.

As for the specific language problems Norwegian dyslexic students acquiring English as L2 might face, there is a dearth of empirical data concerning this issue. Although it has been estimated that between 5 to 10 percent of the Norwegian population might suffer from dyslexia (Imsen, 2005), research in Norway on the subject of second language acquisition in dyslexic students has been scant, and for a considerable time non-existent. The first systematic study which focuses on how Norwegian dyslexics learn English as a second language has been conducted by Kaasa and Helland (Kaasa, 2001; Helland and Kaasa, 2005) and, to the best of my knowledge, it is currently the only study in this field.

In Norway, English is a compulsory school subject from Grade 1 (age 6) through the first year at high school in the programs for general studies and the second year in vocational training

(age 17 and 18 respectively).[2] Whereas Norwegian students are reported to get top scores on a variety of international ability tests of English as an L2, dyslexic students usually do not achieve the same high standards as their normally developing peers (Helland and Kaasa, 2005; Helland, 2008).

In their study, Helland and Kaasa tested both oral and written language skills of dyslexic sixth and seventh graders. Based on the findings of this study, one might expect the following pattern of dyslexic difficulties in Norwegian school children with dyslexia: L2 comprehension seems to be easier than producing sentences, while producing semantically correct sentences looks more problematic than making sentences with correct syntax. Compared to reading and translation, spelling is more demanding for the dyslexic. For example, dyslexics in this study attempted to spell words phonetically to a larger extent than did non-dyslexics, such as *littel* for *little* and *hai* for *high*. Helland and Kaasa argue that the orthographic irregularities of English, which is referred to as a dyslexic language exacerbating dyslexic tendencies in children (Spencer, 2000), might be especially challenging to Norwegian dyslexics. According to them, this is due to the fact that "the Norwegian dyslexic is trained to attend to regular grapheme/phoneme correspondence and to sequencing of phonemes" (p. 45). With respect to the morphological skills of the dyslexic subjects, which also constitute the main concern of the present study, the test results indicate that L2 morphology is the most difficult area for these students. Here, it is important to note that Norwegian dyslexics show impaired morphology in their L1 too (Hagtvet and Lyster, 2003, cited in Helland and Kaasa, 2005). In the light of this finding, Helland and Kaasa speculate that poor morphological skills in the L2 could be explained by a possible interference from poor L1 morphological skills.

The question of whether the dyslexic problems in L1 always give rise to similar problems in L2 appears to have aroused great interest in research circles focusing on dyslexia and second language acquisition, and will be dealt with thoroughly in the remaining two sections of this chapter.

[2] **Kunnskapsløftet** Læreplan for grunnskolen og videregående opplæring (LK06) [The National Curriculum for Knowledge Promotion in Primary and Secondary Education and Training].

2.3 The Linguistic Coding Differences Hypothesis

Until the late 1980s the notion of a learning disability being the cause for problems associated with learning another language was not widely known. However, the appearance of a paper by Sparks and Ganschow (1991) introducing the *Linguistic Coding Differences Hypothesis* (henceforth LCDH) as a possible explanation of foreign language learning difficulties has stimulated considerable research in the field of second language acquisition in individuals with learning disabilities, including dyslexia (Schwarz, 2000; Krug *et al.*, 2002).

The LCDH is derived from the work of Vellutino and Scanlon (1986, cited in Sparks and Ganschow, 1991), who found that poor readers and writers had difficulties processing the structural and formal properties of spoken and written words, and coined the term "linguistic coding" to refer to the use of phonological, syntactic, and semantic aspects of the language to code information. According to this hypothesis, skills in the native language components – phonological/orthographic, syntactic, and semantic – serve as a foundation of L2 learning (Sparks and Ganschow, 1991; Ganschow, Sparks and Javorsky, 1998). The LCDH further posits that both native and second language learning depend on basic language mechanisms and that "problems with one language component (for example, phonological/orthographic processing) will have a negative effect on other components (for example, vocabulary or syntax) of both native language and foreign language acquisition" (Sparks *et al.*, 1998, p. 241). Therefore, "to become proficient in the study of a FL one needs an intact native language base" (Sparks and Ganschow, 1993, p. 213-214). In short, in this hypotheses, mastery of the L2 is thought to be partially dependent on competence in the L1.

In order to test the LCDH, numerous empirical studies have been conducted, most of them by Sparks and Ganschow and their associates. The conclusion that follows from these studies is that L2 acquirers identified as dyslexic or at risk for dyslexia are particularly weak in the phonological and syntactic language skills in both the native and the subsequent language, whilst they do not have any significant difficulties with semantics (e.g., Downey, Synder and Hill, 2000; Ganschow and Sparks, 2000; Kahn-Horwitz, Shimron and Sparks, 2006; Morfidi *et al.*, 2007; Sparks *et al.*, 1991, Sparks and Ganschow, 1993a). In accordance with this result, Sparks *et al.* (1997) have found that one's phonological recoding skills are crucial for foreign language word decoding, which they suggest is a key predictor of foreign language

proficiency. Recall from section 1.3 that phonological processing deficiencies are typically considered to be the core problem of developmental dyslexia in L1 too.

Although there is no 'cure' for dyslexia (Thomson, 2008), dyslexic individuals can develop successful coping strategies for their literacy problems through professional teaching (Schneider and Crombie, 2003). To this end, as an alternative to *natural communication* approaches (Krashen, 1982, cited in Sparks and Ganschow, 1993), Ganschow, Sparks, and their colleagues suggest a *multisensory structured language* approach (henceforth MSL) to second language instruction for the dyslexic population. The MSL approach emphasizes the direct, systematic, and explicit teaching of the phonology/orthography, syntax and morphology systems of the second language. It also encourages the simultaneous use of students' visual, auditory, and tactile-kinesthetic skills, and further recommends that lessons be taught in both the L1 and the L2 (Sparks *et al.*, 1998; Sparks and Miller, 2000). The learning activities in the multisensory L2 approach have been reported to be highly interactive and student-centered, and also frequently beneficial for non-dyslexic students in the class (Turner, 2001; DiFino and Lombardino, 2004; Nijakowska, 2008). Simon (2000), herself dyslexic and a speech-language pathologist and ESL specialist, also advocates teaching a second language to dyslexics through direct and explicit instruction methods: "Since language learning is not a *natural process* [italics added] for some of us, direct instruction and repetition supply the support needed to develop greater accuracy, fluency, and confidence in our first and second languages" (p. 163).

To recap, the LCDH proposes that one's native language skills play a large role in the success or failure of second language learning due to the cross-language transfer between L1 and L2. However, there is also a growing body of research which is not supportive of this viewpoint. This point is the focus of the next section.

2.4 Differential dyslexia

As discussed briefly in section 1.3, the severity of deficits in phonological skills, particularly phonemic awareness, may be influenced by the opacity of a script. Similarly, Miles (2000) explains that, in comparison with '*opaque*' or '*deep*' languages where the relation between a letter and its sound is inconsistent (e.g., English, French, Danish), '*transparent*' or '*shallow*'

languages which have a consistent phoneme-grapheme correspondence (e.g., Italian, Turkish, Hungarian) are likely to cause less difficulty for dyslexics. Nevertheless, it should be noted that transparent languages may also pose problems for its dyslexics. For example, Hungarian dyslexic children, just like German dyslexics, may have few deficits in their phonological processing skills, yet they still exhibit serious problems acquiring accurate and fluent word reading, due to the agglutinal nature of the language. *Diszlexiaveszélyeztetettség*, the Hungarian for *at risk of dyslexia* provides a good example of this (Smythe and Everatt, 2000). Consequently, as pointed out by Miles (2000, p. 193), "particular languages generate particular dyslexic manifestations".

The discussion above indicates that different languages may make different demands on the cognitive processing system (Smythe and Everatt, 2002). Therefore, as argued by Smythe and Everatt (2004, p. 19):

> (…) it seems highly plausible that the underlying cognitive causes of dyslexia will vary across languages. As such, it may be possible that the same individual is found to be dyslexic in one language, but not in another. If any given individual uses two languages that have different cognitive demands, it is possible that they will demonstrate signs of dyslexia in one language but not in a second. Although relatively rare in the literature, there are studies of, what one might call, *differential dyslexia* [italics added].

Veii and Everatt (2005) cite a large-scale study carried out by Kline and Lee (1972) to assess a group of Canadian children who were simultaneously learning to acquire literacy in both English and Chinese. They found that some children had problems with learning Chinese but not English, while others had difficulties with English but not Chinese. Furthermore, Wydell and Butterworth (1999) report a case of a well-educated English-Japanese bilingual boy (henceforth AS) with monolingual dyslexia in English (his native language). AS was born in Japan to a highly literate Australian father and an English mother. AS's ability to read and write in Japanese was at a superior level, despite his severely impaired reading and writing ability in English. He was especially poor at English tasks involving phonological manipulation (e.g., rhyme judgments, Spoonerising, phoneme segmentations, etc.). The explanation of this extraordinary case offered by Wydell and Butterworth (1999, p. 299) is that "(…) the process of phonological recoding may be organized differently for English and Japanese." And they accordingly conclude as follows:

> (…) it is clear that this kind of developmental dyslexia is not a general deficit that will apply to any orthography that the reader has learned (…). Rather this is an interaction between a cognitive deficit and the specific demands of the orthography to be learned. It may be the case that AS might have some cognitive deficit, but this deficit only affects the reading processes (demands) required for English. That is, English requires a fine 'grain' tuning of the orthography-to-phonology mapping, while Japanese only requires a much coarser grain tuning. (Wydell and Butterworth, 1999, p. 300)

A follow-up study was also conducted on AS by Wydell and Kondo (2003). It was hypothesized by the researchers that if AS were a true dyslexic in English, greater exposure to English, due to the fact that he was successfully taking a BSc course in an English-speaking country, would not change his core phonological deficit, which led to his dyslexia in English but never affected his reading in Japanese. The results of the study demonstrated that AS was still a phonological dyslexic in English and despite greater exposure to English over time, his phonological deficit persisted.

In contrast to the case of AS, Miller-Guron and Lundberg (2000) reported some Swedish dyslexics who found it easier to read and write in English than in Swedish, even though Swedish, a transparent language, was their first language. One interpretation of this finding was that these exceptional dyslexics, who stated a preference for second language reading, could employ an alternative word decoding/encoding technique while reading in the deeper L2 orthography (Miller-Guron and Lundberg, 2000). In other words, although these children had problems developing advanced phonological skills necessary for the successful acquisition of Swedish literacy, they were able to use alternative reading strategies, such as whole word approaches, which are required when reading English (Veii and Everatt, 2005).

Smythe and Everatt (2002, p.76-77) sum up the results of the research studies on differential dyslexia as follows:

> These results are not a function of language exposure but the way that dyslexia manifests itself in different languages, demonstrating that a given underlying weakness may cause difficulties in one language but not another. Such research challenges the notion that a dyslexic individual who experiences difficulties in one language will have difficulties in all languages.

What is common to all these cases described above is that they do provide evidence against the common assumption, very often true though, that the native language has a strong influence on the L2 in individuals with dyslexia. To put it another way, the proficiency level of a dyslexic in one language will always affect his or her level of proficiency in other languages. At present, this issue appears to be highly complex and hence calls for more research into the field of bilingual dyslexia.[3]

2.5 Summary

Given the fact that dyslexia is a language-base learning disability, it is not unexpected that acquiring a second language can be an extra load on dyslexic students. Among the L2 learning problems they face are a general lack of metalinguistic awareness, poor short-term memory and very low levels of phonological awareness skills, which may impede acquiring new words and grammatical structures. As for the reason why L2 learning is burdensome for the dyslexic, research findings indicate that there are strong links between native and second language learning problems. Therefore, if a person has language difficulties in his or her first language, it is very likely that this person will face similar problems while acquiring a second language. Based on research studies, it has been suggested that using direct and explicit methods of instruction would be beneficial in teaching a second language to dyslexics.

On the other hand, it has also been reported that there are a few individual cases who are dyslexic in one language, but not in another. To account for this phenomenon, researchers assume that different languages may make different demands on the cognitive processing system. The common assumption that language skills and deficiencies in L1 influence L2 is indeed often true, but it would be wrong to take it for granted that all language problems dyslexics may experience in an L2 are always caused by poor proficiency in the native language.

[3] This term is used in its widest sense to cover all those involved in the learning of a second language.

3. ON THE ROLE OF PHONOLOGICAL AWARENESS and MORPHOLOGICAL AWARENESS in READING COMPREHENSION

3.1 Introduction

This chapter addresses the following issues:

- What is reading comprehension?
- How can phonological awareness, which is critical for word decoding, have an effect on reading comprehension skills in individuals with and without a reading disability?
- What is the relationship between morphological awareness and reading achievement (i.e. word reading and written text comprehension)?
- Are dyslexics' morphological awareness skills deficient compared with their normal-age peers?

3.2 Defining reading comprehension

Reading comprehension is a multidimensional and complex process which requires higher-level cognitive abilities (e.g., short-term memory). Snow and Sweet (2003, p. 1) define reading comprehension as "the process of simultaneously *extracting* and *constructing* meaning." Incorporating these two terms into their definition, they recognize the two main challenges the reader faces in the act of reading. These are: (a) "figuring out how print represents words and engaging in the translation of print to sound accurately and efficiently (extracting)", while at the same time, (b) "formulating a representation of the information being presented, which inevitably requires building new meanings and integrating new with old information (constructing meaning)" (ibid).

A variety of variables have been identified in the literature (e.g., vocabulary, listening comprehension, working memory; see e.g., Stanovich, 2000, for a review) as having predictive value in relation to reading comprehension performance. However, in the present study, we confine our focus to two of these significant variables: phonological awareness and

morphological awareness. Therefore, in the subsequent sections, phonological awareness and morphological awareness are discussed in some depth.

3.3 The role of phonological awareness in reading comprehension: An indirect prerequisite?

As discussed in the previous chapters, developmental dyslexia is typically associated with poor decoding skill, which is regarded as the manifestation of an underlying core phonological deficit. Therefore, with the above definition in mind, we may expect that dyslexics who have trouble recognizing the words of text a (i.e. extracting) will have trouble understanding the text. This holds true especially for beginning readers in both L1 and L2 who are at risk of developing a reading disability (Lipka and Siegel, 2007), but it also applies to young non-dyslexic L2 learners (Gottardo and Mueller, 2009).

Not surprisingly, in the literature on reading processes, phonological processing skills have been proposed as the most robust predictor of reading comprehension performance (Ghelani, Sidhu, Jain and Tannock, 2004). Recall from section 1.3 that phonological awareness, the attention to the sounds of language, has been reported to be one of the areas where phonological processing problems associated with dyslexia most often occur. This kind of awareness is thought to be essential to understand that sounds making up a word are represented by combinations of letters. Therefore, dyslexics with poor phonological awareness, in particular at the level of the phoneme, find it difficult to apply grapheme-phoneme conversion rules, which enable individuals to recognize words that they have not encountered in print before (Beaton, 2004; Catts and Kamhi, 2005). Deficits in phonological awareness often lead to poor skills in decoding, which in turn cause poor reading comprehension. Therefore, reading comprehension difficulties in dyslexia are viewed as secondary, a consequence of poor word decoding (Høien and Lundberg, 2000). Stated simply, dyslexic readers' "slow, energy-demanding and deficient decoding makes such high demands on the (…) mental resources that there is no room left to carry out interpretation" (ibid., p. 101). At this point, it seems safe to say that phonological awareness indirectly affects reading comprehension ability through its direct effects on word recognition.

On the other hand, evidence from research indicates that phonological awareness becomes far less significant as a predictor of reading comprehension, as children with dyslexia and without dyslexia grow older (e.g., Muter *et al.*, 2004; Ransby and Swanson, 2003). This means that comprehension problems in reading texts which arise from deficiencies in single-word recognition skills are not always the case for older dyslexics. Many of them, due to a higher level of print exposure, learn to develop mechanisms to compensate for their decoding deficits, such as sight-word reading, controlled speed, and relying on context more than their non-dyslexic peers. As a result, dyslexics' reading time is often longer than that of their normally reading peers. Nevertheless, by utilizing such compensatory strategies, they are often able to comprehend written language within normal or close to normal limits (Aaron, 1989; Aaron and Joshi, 1992; Bruck, 1988; Corkett and Parrila, 2008; Miller-Shaul, 2005; Nation and Norbury, 2005; Nation and Snowling, 1998; but see also Simmons and Singleton, 2000 for a discussion of dyslexic students' poor reading comprehension performance on inferential questions). It is worth noting, though, that when such strategies cannot be used successfully in tasks, such as timed reading tests, word decoding deficits in dyslexic readers show up. Put differently, untimed conditions usually have a positive effect on reading comprehension for individuals with dyslexia (Aaron, 1989; Aaron and Joshi, 1992; Lesaux, Pearson and Siegel, 2006).

Given the cross-language transfer between L1 and L2 skills, it should probably come as no surprise that bilinguals employ similar comprehension strategies in both of their languages (Lundberg, 2002). A number of studies have convincingly documented that the underlying constructs (phonological awareness, among others) which contribute to reading comprehension are similar not only for L1 and L2 students, but also for L2 students with reading difficulties (e.g., Lesaux, Lipka and Siegel, 2006; Lipka and Siegel, 2007; Low and Siegel, 2005). However, as pointed out by Lipke and Siegel (2007, p. 126), despite the common factors influencing reading comprehension in each of these groups, the weight of each factor varies from one group to another. Indeed, the extent to which two of these factors (viz. phonological awareness and morphological awareness) affect reading comprehension performance in L2 learners with and without dyslexia is also the very question that is posed in this study.

To sum up then, phonological awareness, particularly at the phoneme level, appears to be a critical prerequisite for the acquisition of decoding skills in both dyslexic and non-dyslexic

individuals. Accordingly, reading comprehension ability is influenced indirectly by phonological awareness through its direct effects on word recognition. In other words, phonological awareness serves as an indirect prerequisite for reading comprehension. However, the relative significance of phonological awareness as a predictor of reading comprehension performance may decrease gradually during the course of development. Dyslexics, as they get older, develop strategies to compensate their decoding deficits and comprehend written texts within normal limits. Reading comprehension abilities of L1 and L2 students with and without reading disabilities seem to be affected by similar underlying constructs. However, the influence of each factor varies among different groups of students. In the next section another construct bearing upon reading comprehension performance, namely morphological awareness, is discussed in detail.

3.4 The interplay among morphological awareness, reading and reading comprehension

English is an alphabetic language, and in alphabetic writing systems letters or letter combinations more or less represent phonemes. Hence, phonological awareness is considered fundamental to learning alphabetical principles (Casalis and Louis-Alexandre, 2000). However, recall from section 2.4 that English is referred to as an opaque language, which often has no one-to-one mapping between phonemes and graphemes. In contrast to shallow orthographies, English transcribes spoken words at a lexical level rather than as a sequence of sounds. In other words, English represents words both in units of sound (i.e. phonemes) and units of meaning (i.e. morphemes) (Mann, 2000; Reed, 2008). The fact that *health* retains the *ea* spelling of its base form, *heal*, even though the vowel of *health*, /ɛ/, differs from the vowel of *heal*, /i/, is a typical example of morphologically driven spelling in English (Bourassa and Treiman, 2008).

The English language, mainly due to the characteristics explained above, is described as morphophonemic rather than exclusively alphabetic (see Chomsky and Halle, 1968, for a detailed discussion of the morphophonological nature of English orthography). Consequently, although phoneme awareness is a necessary condition to reading and writing success in English, it is not a sufficient condition. Successful readers of English must not only have phonological awareness but also morphological awareness (Mahony, 1994). Indeed, data from

several languages in Europe (e.g., Italian, Dutch, Swedish) also suggest that skilled reading involves morphological processing (Jarvella, 1995).

Before we delve into how morphological awareness bears on reading achievement, it is essential to elucidate what is meant by the terms morphology and morphological awareness. Morphology is defined as "the study of the hierarchical and relational aspects of words and the operation on lexical items according to word formation rules to produce other lexical items" (Leong and Parkinson, 1995, p. 237). Word formation in English is generally of two types: inflectional and derivational. Inflectional affixes signal grammatical relationships (e.g., past tense, progressive, and plurality marking) and they do not alter the part of speech of the stem. On the other hand, class-maintaining derivational affixes (i.e. derivational prefixes) form new words without changing the grammatical class (e.g., happy => unhappy), whereas class-changing derivational affixes (i.e. derivational suffixes) produce new lexical items by altering the grammatical class (e.g., happy => happiness). The inflectional system reflects a small, closed and rule-based process while the derivational system is a large, open class of lexical affixes (Koda, 2000; Mahony, 1994; Reichle and Perfetti, 2003; Singson, Mahony and Mann, 2000). This thesis is concerned with this latter category of grammatical morphemes, more specifically with the derivational suffixes. This is because: (1) the participants in the present study are high school students and "students' knowledge of what suffixes contribute to the meaning of a derivative was found to continue to increase through high school, and to be correlated with reading ability in high school" (Nagy, Diakidoy and Anderson, 1993, p. 156), and (2) compared to inflections, "derivations might turn out to be better predictors of reading achievement than inflections because they involve understanding of phonological relations, syntactic roles, and semantic relations" (Carlisle, 1995, p. 195).

With respect to the awareness of morphology, Carlisle (1995) has provided a clear definition. According to this oft-cited definition, morphological awareness involves the "conscious awareness of the morphemic structure of words and (the) ability to reflect on and manipulate that structure" (p. 194). Morphological awareness can contribute to a variety of literacy skills. Green (2009, pp. 283-284) delineates how this kind of awareness can relate to word recognition, reading fluency and accuracy, and reading comprehension. First, morphological awareness enables individuals to analyze the internal structure of words in order to decode them more quickly and accurately. For example, the word *sleeplessness* may seem like a long and complex string of letters to poor readers. But when it is broken down into its morphemes

(e.g., *sleep*, *less*, *ness*), it becomes more decodable. Moreover, specific knowledge of derivational suffixes and their pronunciations can facilitate decoding (e.g., the derivational ending *–tion* is consistently pronounced *shun*). Recall also from section 3.3 that the more effectively and fluently one recognizes and reads the words, the better opportunity the reader has for successful comprehension. And lastly, morphological awareness can also help both L1 and L2 speakers increase their vocabulary and comprehension skills by using the meanings of familiar base words and suffixes to guess the unfamiliar derivatives. For example, a reader who encounters the word *owlet* could benefit from his or her existing knowledge of the word *piglet*, and infer that an owlet must be a young owl, since the suffix *–let* means "a smaller/younger version of something."

Given these various ways in which morphological awareness can facilitate reading achievement (both word recognition and reading comprehension) considerably, it is surprising that this area of linguistic awareness has received less attention in studies of reading and reading disability, especially when compared to phonological awareness, which has been documented to be crucial for literacy skills by an impressive body of research (Lyster, 2002; Wolter, Wood and D'zatko, 2009). However, a burgeoning body of research has already evidenced that morphological awareness, in particular awareness of derivational morphology, makes a considerable contribution not only to word reading and reading comprehension in skilled monolingual and bilingual readers (e.g., Apel and Thomas-Tate, 2009; Carlisle and Fleming, 2003; Carlisle and Stone, 2003; Green *et al.*, 2003; Katz, 2004; Ku and Anderson, 2003; Lam, 2009; Rispens, McBride-Chang and Reitsma, 2008; Ramírez Gómez, 2009), but also to poor readers' (including dyslexics) word reading and reading comprehension (e.g., Abu-Rabia, 2007; Leikin and Zur Hagit, 2006; Nagy *et* al., 2003; Siegel, 2008).

For example, in a study for third through sixth graders, Singson, Mahony and Mann (2000) investigated the relation between the syntactic aspects of derivational suffixes and decoding ability. They found that throughout the higher elementary grades morphological awareness offered an independent contribution to word reading (i.e. decoding) above and beyond the well-known reading related factors of phonological awareness, vocabulary knowledge and short-term memory. Their results further revealed that, between Grades 3 and 6, the role of phonological awareness in decoding gradually decreased at the same time that of morphological awareness increased. Therefore, Singson *et al*. have contended that "(…) the relative contribution of phoneme vs. morpheme awareness is age dependent" (p. 245).

In terms of reading comprehension, in a longitudinal study of children in kindergarten through second grade, Carlisle (1995) found that although kindergartners had trouble with a morphological awareness task, first graders performed better on this task. First-graders' performance on the morphological production task was the strongest predictor of their success on a reading comprehension task which they were given in Grade 2. A similar developmental trend was observed in another study of third and fifth graders (Carlisle, 2000). The findings from this research showed that the contribution that awareness of morphological structures made to reading comprehension was significant at both levels, but the contribution was stronger for the fifth than for the third grade. Along the same lines are the results of the recent study of Kieffer and Lesaux (2008) which showed that awareness of derivational morphology played an increasingly important role in reading comprehension for Spanish-speaking English language learners, as for monolinguals. In their two-year longitudinal study they demonstrated that the relationship between morphological awareness and reading comprehension strengthened between fourth and fifth grade. They also argued that although morphological awareness played a similar role in the reading comprehension of L2 learners to that found among native English speakers, L2 learners might have lower levels of derivational morphological awareness and this could be important as a source of the reading comprehension difficulties which seemed to be common among English language learners.

Taken together, the empirical evidence of the studies reviewed above indicates that the importance of morphological awareness to both decoding and reading comprehension seems to increase with age. Turning to individuals with dyslexia, we mentioned above (section 3.3) that dyslexics learn to develop compensatory strategies to comprehend written texts, as they get older. Although this issue is indeed one of the focal points of the next section, I will briefly mention here that, according to some researchers (e.g., Ellbro and Arnbak, 1996), some of the reading strategies dyslexics adopt may be based on the recognition of morphological units. So, considering these arguments, it would not be wrong to say that both normally-developing and dyslexic students show developmental trajectories in their acquisition of literacy skills. Kuo and Anderson (2006, p. 173) summarize quite well the points that I have attempted to make so far in this chapter:

> Among beginning readers, the greatest challenge in reading is to convert graphemes into phonological representations and map them onto oral vocabulary. Comprehension follows readily from successful decoding because primer texts are written with words children know from oral language. However, intermediate readers encounter a greater number of morphologically complex words in written text. These are less common in oral language. Thus, for intermediate readers, successful decoding does not guarantee comprehension. (...) the ability to identify the stem in unfamiliar words and to understand the contribution of suffixes should become increasingly important for reading comprehension beyond the beginning level.

3.5 Morphological awareness in dyslexics and poor readers[4]

Over recent decades, numerous studies across languages have offered evidence that morphological awareness skills in dyslexics and poor readers are inferior in both oral and written language tasks when compared to same-age skilled readers. This is the case in both L1 and L2 (e.g., Abu-Rabia, Share and Mansour, 2003; Carlisle, 1987; Casalis, Colé and Sopo, 2004; Champion, 1997; Chung *et al*., 2010; Coleman *et al*., 2009; Deacon, Parrila and Kirby, 2006; Fowler and Liberman, 1995; Helland and Kaasa, 2005; Joanisse *et al*., 2000; Leong, 1999; Rubin, Patterson and Kantor, 1991; Schiff and Raveh, 2006; Shankweiler *et al*., 1995; Siegel, 2008; Tsesmeli and Seymour, 2006; Vogel, 1977). For example, morphemic errors that the language-learning-disabled children in Rubin *et al*.'s study made included primarily omissions of inflectional and derivational morphemes (such as *look* for *looked* and *Jim* for *Jim's*) and occasional substitutions (such as *interesting* for *interested*) and additions (such as *looks* for *look* and *drafted* for *draft*). Likewise, in Coleman *et al*.'s study most of the young adults with dyslexia spelt derivational suffixes incorrectly (e.g., attempts at *fortunate* that did not reflect knowledge of the root word *fortune*). These types of errors have been reported to be characteristic not only of poor writing but also of poor reading (Rubin *et al*., 1991).

Seemingly, the finding that individuals with reading disabilities have morphological difficulties is not in dispute. However, what is in dispute is the role of phonological awareness in the morphological processing skills of such individuals, and the relative importance of these two constructs in reading achievement. There are mainly two contrasting views

[4] As will become clear, not all the studies reviewed in this section have used a strict definition of dyslexia and the term dyslexics for their subjects. Among others, the terms "poor readers" or "the reading-disabled" are commonly used in many of these studies.

regarding this issue. In one of these, weakness on morphological awareness tasks is assumed to be caused by deficient phonological abilities (e.g., Fowler and Liberman, 1995). Hence, the role of morphological awareness in reading is seen as secondary to phonological abilities. This view has also been termed the "phonological" hypothesis of morphological deficit in dyslexia (Leikin and Zur Hagit, 2006). In the other, contribution of morphological awareness to reading achievement is seen as independent of the well-documented contribution of phonological awareness (e.g., Nagy *et al*., 2003; Casalis, Colé and Sopo, 2004; see also Deacon, Parrila and Kirby, 2008, for a review of the various current positions on this issue).

The reading-disabled children in Fowler and Liberman's (1995) study had particular difficulty in the production of morphological forms which underwent a phonological change within the base morpheme (e.g., *courage*/*courageous*, *five*/*fifth*), but they fared better when the phonology of the base was preserved in the derived form (e.g., *danger*/*dangerous*, *four*/*fourth*). The authors interpreted the difficulties with the morphological tasks as a consequence of phonological processing deficiencies in these children. That is, problems with morphological structure are a by-product of poor readers' problems with phonological structure (Mann, 2000). Very similar results were obtained in some other studies (e.g., Champion, 1997; Shankweiler *et al*., 1995; Windsor, 2000).

In contrast to the above studies, in Nagy *et al*.'s (2003) research on second-grade at-risk readers, morphological awareness made a significant unique contribution to reading comprehension when orthographic, phonological and oral vocabulary factors had been controlled for. Furthermore, a recent large-scale study of 1238 sixth-grade students with and without dyslexia revealed that the tests assessing single-word decoding and reading comprehension had higher correlations with the morphological awareness tests than with the phonological awareness task (Siegel, 2008). It also showed that morphological awareness made a greater contribution to reading achievement (i.e., written text comprehension and single-word reading) than did phonological awareness. In line with these findings, Casalis *et al*. (2004), who examined the morphological awareness skills of dyslexic children, found that the development of morphological knowledge in dyslexics might depend on their age and reading experience rather than on their phonological abilities. These authors further argued that dyslexics might develop a certain type of morphological knowledge which they could utilize as a compensatory reading strategy.

In fact, a similar argument has been put forward by Elbro and Arnbak (1996) to account for the finding that Danish dyslexic adolescents seemed to be able to use morphological information effectively in word decoding and reading comprehension. Elbro and Arnbak found that the students with dyslexia read morphologically complex but semantically transparent words (e.g., *sunburn*) faster and more accurately than non-transparent words (e.g., *window*). Intriguingly, this was not the case for the control group (i.e. younger students matched on reading level). That is, the control students did not use or perhaps did not even need such a semantically transparent structure to decode the words. These and other results of their study led them to conclude that "the morphological analysis strategy observed in dyslexic teenagers is a compensatory strategy developed in the context of their poor phonological recoding skills" (pp. 216-217). Some additional data in support of this hypothesis come from a training study conducted by Elbro and Arnbak (1996). Dyslexic students who received morphological awareness training showed improved reading comprehension relative to the control group, which consisted of students with dyslexia who did not participate in the training program. The experimental group, however, did not do better more than the controls on tests of phonological awareness or in receptive vocabulary. Based on these results, the authors suggested that awareness of morphemes can be trained independently of awareness of phonological units (Arnbak and Elbro, 1998, 2000). Similarly, in a more recent paper Katz and Carlisle (2009) report on an intervention program, where three fourth-grade students with mild-to-moderate reading and language difficulties received instruction in morphological-analysis strategies. The results of the study pointed to improvements in all three students' word reading and reading comprehension skills.

In sum, given the results of the studies reviewed thus far and the morphophonological nature of the English language, it is obvious that both L1 and L2 readers of English must have a certain amount of phonological awareness and morphological awareness to be able to read and comprehend written texts. Therefore, as aptly phrased by Carlisle (2003), the discussion above is not "intended to diminish the importance of the finding that poor readers have difficulties with phonological complexities of opaque or "shift" derived forms (…). However, because normally achieving readers also have more difficulty with "shift" words than transparent words (…) it is apparent that students' problems with phonological processing may be a matter of degree, not kind" (pp. 307-308).

3.6 Summary

Reading comprehension is a complex process, which requires readers not only to figure out how print represents words but also to construct meaning from text by integrating new information with existing information. Phonological awareness and morphological awareness have been identified as two underlying constructs which bear upon this process significantly.

Phonological awareness, in particular at the level of the phoneme, is essential to grasp the associations between letters and speech sounds. Dyslexics who lack this kind of awareness often have very poor decoding skills which, in turn, may cause them to have serious problems with comprehending written texts. However, often due to print exposure, many dyslexics learn to compensate for their decoding deficits by developing alternative reading strategies (e.g., relying on context more than their normally-reading peers). As for the reading comprehension skills in bilinguals, it has been reported that the underlying constructs which contribute to reading comprehension in such individuals are similar in both L1 and L2.

The English language is morphophonemic. This means that English represents words at a morphological as well as a phonological level. Consequently, not only awareness of phonemes but also morpheme awareness is a necessary condition for both L1 and L2 speakers of English to read and write successfully in this language. Morphological awareness, defined as the explicit knowledge about the meaning and the structure of a word, may contribute to reading related skills in a variety of ways. For example, specific knowledge of derivational suffixes and their pronunciations can facilitate decoding (e.g., the derivational ending *–tion* is consistently pronounced *shun*), which, in turn, aids reading comprehension. There is an increasing body of research which indicates that morphological awareness makes a unique contribution to students' word decoding and reading comprehension performance. And the magnitude of this contribution appears to increase with age in both dyslexics and non-dyslexic students.

In a number of studies evidence has been found that morphological awareness skills in individuals with dyslexia are often much poorer than in their chronological-age peers. Although this finding is beyond dispute, the relative importance of phonological awareness and morphological awareness skills in reading achievement is still under discussion.

PART II: The Study

4. PURPOSE of THE PRESENT STUDY

From the review of the literature in the previous chapter, it seems apparent that morphological awareness skills of students, be it with or without a reading disability, play a role in their reading comprehension performance, and this holds not only for readers of alphabetic languages but also for readers of non-alphabetic scripts. However, despite the growing interest in this field of study, awareness of morphemes and its relation to reading comprehension in L2 learners with developmental dyslexia has remained less explored to date. The study presented here is therefore an attempt to add to the knowledge of the effects of morphological awareness on reading comprehension skills of dyslexic students acquiring a second language.

The current research has two main objectives:

(1) to investigate how Norwegian L2 students with dyslexia differ from their chronological-age peers in terms of their performance on morphological tasks as well as on phonological awareness and reading comprehension tasks;

(2) **a)** to examine whether the correlations of morphological awareness tasks (in the form of knowledge about derivational suffixes) with reading comprehension in *students with dyslexia* is higher or lower than that of phonological awareness;
b) to see whether reading comprehension performance in *typical L2 readers* is correlated with derivational morphological awareness over and above other variables such as phonological awareness.

Note that the latter two research questions were designed to find correlational evidence for or against the two contrasting views on the role of phonological awareness and morphological awareness in reading skills of students.[5] Before we move to the hypotheses of the study, let us

[5] We were not able to perform more sophisticated statistical analyses, such as multiple regressions due to, among other things, inadequate sample size.

recall these views briefly here. According to the proponents of the phonological hypothesis of morphological deficit in dyslexia (e.g., Shankweiler *et al*., 1995), morphological awareness and phonological awareness are highly intercorrelated and poor readers' problems with regard to these two constructs have a common source of difficulty which lies in the phonological domain of language. For this reason, the contribution of morphological awareness to reading achievement is not seen as independent, but rather as a derivative of phonological abilities. On the other hand, the alternative view suggests that, as Deacon and Kirby (2004, p. 225) put it "(…) morphological awareness is not simply 'more phonological' – that is, (…) the relationship between morphological awareness and reading operates independently of phonological awareness." This seems to be the case both in dyslexic (e.g., Siegel, 2008) and in non-dyslexic students (e.g., Nagy, Berninger and Abbott, 2006).

In line with the above objectives and based on previous literature, the following hypotheses may be proposed:

Hypothesis 1:

Control students (i.e. non-dyslexics) would outperform experimental students (i.e. dyslexics) on all of the tests administered in this study.[6]

However, since the dyslexic subjects tested in the study are high school students who have had a certain amount of exposure to the English language, it is also predicted that some of these students may have built compensatory strategies that could help them perform well, especially on the test assessing reading comprehension. Compensated dyslexics are also expected to do well on the morphological awareness task (real-word version) since the words used here are high-frequency words known to most dyslexics at this age and grade level. Therefore, we expect these two tests to be easier than the phonological awareness and the pseudowords tests. But at the same time, it is predicted that the other morphological task (pseudoword version) may be the most difficult task for the students in this group, as it requires a higher level of abstraction and sensitivity to derivational suffixes. It also does not

[6] All the participants in the current study received the same test battery which included three language and literacy tests in English: A morphological awareness test consisting of two multiple-choice subtests on derivational suffixes (the real-word and the pseudoword tests), a phonological awareness test based on phoneme and syllable deletion, and a reading comprehension test comprised of nine texts followed by multiple-choice questions. Each of these tests will be described in more detail in the following chapter.

allow the student to rely on his or her vocabulary. Accordingly, it is anticipated that the gap between real-word and pseudoword scores would be wide in this group. As for the test measuring phonological awareness, the prediction is that dyslexics would earn relatively low scores on this task due to the fact that dyslexia has often been characterized by a core deficit in the phonological processing skills and most of the dyslexic individuals do not outgrow such problems even in adulthood.

Controls are expected to get higher scores on reading comprehension and morphological awareness task (real-word version) than on phonological awareness and the other morphology test (pseudoword version). The reading comprehension and the real-word tasks are not predicted to be challenging for the students in this group when their grade level is taken into consideration. Therefore, it is suggested that control students' performance on these two tasks may exhibit ceiling effects. On the other hand, the pseudoword test is expected to be challenging for at least some of these students as well, due to the reasons mentioned above for dyslexics. The performance gap on the two morphology tasks is anticipated to be narrower in this group of students in comparison with the experimental group. The phonological awareness test is also predicted to be somewhat demanding for the control students as it includes a number of multisyllabic, less frequent words besides simple, one-syllable words.

Hypothesis 2:

a) Considering the prediction that dyslexics would perform relatively better on reading comprehension and real-word tests than on the phonology and the pseudowords tests, it is hypothesized that their reading comprehension performance would have a positive and stronger correlation with the real-word version of the morphological awareness task than with the phonological awareness and the pseudoword tests. Due to the fact that morphological awareness increases with age and schooling, it is predicted that the correlation between the pseudoword test and the written text comprehension would also be positive and larger than the correlation between the phonological awareness test and the written text comprehension.

Alternatively, it is anticipated that phonological awareness may have a positive and stronger association with reading comprehension in dyslexic students than in control students. This may be the case because, as mentioned above, morphological knowledge is thought to ride on

phonological abilities especially in normally-developing beginner readers and dyslexics with poor phonological awareness skills.

b) Given that the participants in the present study are high school students and that their experience with the English language is assumed to have provided them with a certain amount of knowledge about derivational suffixes, the prediction is that control students' performance on the reading comprehension test would correlate positively and more strongly with both morphology tasks than with the phonology task.

5. METHOD

In this chapter I will first briefly give information concerning the official permissions that I obtained before commencing the experimental part of the study (section 5.1); secondly, I will introduce the participants (section 5.2); then, I will describe the tests administrated to the subjects (5.3) and lastly, I will explain the procedure of the study (5.4).

5.1 Official Permissions

The current project was formally approved by the Norwegian Social Science Data Services (see Appendix A) and the Troms County Regional Office of Education (see Appendix B). Having gained permission from the authorities, I sent a letter to each high school in Tromsø describing the research project and asking whether they would be willing to participate in the study (see Appendix C). An information letter with a written consent form for the parents of the students was enclosed with the letter to school administrations (see Appendices D and E). The schools made contact with eligible students, and those who returned the written parental consent were contacted by the researcher and included in the study.

5.2 Participants

The sample of the study was composed of a total of 26 voluntary eleventh graders recruited from five public high schools in the area of Tromsø. Two groups of participants took part in the study, referred to as the dyslexic group and the control group. The dyslexic group consisted of 13 students (6 girls and 7 boys) who had a documented history of developmental dyslexia. The main criterion for selection of students for this group was that they had been previously diagnosed with dyslexia by learning disabilities professionals. The average age of the group was 16.75 (*SD* = 0.43; range 16.25 to 17.83). The control group comprised 13 students (6 girls and 7 boys) of approximately the same mean chronological age (*M* = 16.85; *SD* = 0.43; range 16.08 to 17.83) who were classmates of the dyslexic individuals. They had no history or suspicion of reading disabilities. All participants were monolingual speakers of Norwegian acquiring English as an L2 and had no sensory impairments (e.g., poor hearing or

eyesight). It has to be noted that no pretests were conducted on any participants. The background characteristics of students reported here were obtained from school administrators.

High school students learning English were drawn for the study on the grounds that sensitivity to morphemes is thought to be related to language proficiency, which increases with each grade level, as discussed in chapter 3. Therefore, 17-year-old English learners' knowledge of morphology might be quite relevant for understanding their reading comprehension skills.

5.3 Measures

Four experimental language tasks tapping phonological awareness, morphological awareness, and reading comprehension skills were administered to the students. The same test battery was conducted to all participants. In what follows I present these tests in the same order as they were given to the subjects in the study.

5.3.1 Morphological awareness tasks

This study focuses on derivational morphology and on recognition, not production. Two tasks requiring students to recognize the syntactic properties of derivational suffixes were used to measure morphological awareness. These tasks were paper-and-pencil, multiple-choice tasks where the students read the items and circled their selection on the paper. Both tasks were developed by Singson *et al.* (2000). The participants in their study were sixth graders, who were native speakers of English with no reading disorders. These tests were adopted to assess the morphological knowledge of eleventh grade dyslexics learning English as a second language because "previous studies indicate that dyslexic or learning disabled students are commonly three to five years delayed in their acquisition of (…) morphological knowledge" (Carlisle, 1987, p. 94). Below I discuss these two morphological awareness tasks in turn.

5.3.1.1 Real-word task

This task consists of 10 sentences containing a blank and followed by four real words which are different derivations of the same stem. In other words, the answer choices were different from each other only in their suffixes that signal part of speech. This test contained one token of each noun suffix, *-ion/ation*, *-ity*, *-ist*, and *–ness*, one of each verb suffix *-ate*, *-ize*, and *-ify*, one of each adjective suffix *-ous/ious*, *-al*, and *-ive*. An example sentence from this test is given below.

(1) Those two dogs are almost _____.

A. identical
B. identify
C. identification
D. identity

The ability to make the correct choice in a sentence like the one above, aside from chance, could reflect tacit knowledge of which suffix denotes an adjective, as opposed to a noun, adjective or verb (Singson, Mahony and Mann, 2000). The order of presentation of test items was randomized. The complete list of items is shown in Appendix F.

5.3.1.2 Pseudoword task

This test is identical in structure to the real-word test except that the four answer choices are nonce words composed of a nonsense root followed by one of the real derivational suffixes listed above. Below is an example from this test.

(2) The meeting was very _____.

A. lorialize
B. lorial
C. lorialism
D. lorify

This task was included to avoid the confounding effect of vocabulary knowledge. A correct response would indicate the recognition of grammatical information conveyed by suffixes, independent of their semantic context. For a list of test materials, see Appendix G.

5.3.2 Reading comprehension task

Nine texts differing in length, difficulty and genre, followed by multiple-choice questions were used to assess the students' reading comprehension skills. The first eight texts were taken from the nationwide exam in English for eighth graders administered in 2009[7] and the last one from a sample exam in English for eleventh graders.[8] Reading and writing skills of students diagnosed as dyslexics are known to be at least two school years below what should be expected given their grade level. The eighth-grade-level texts were chosen because the dyslexic eleventh graders' literacy skills in English are thought to be more than two school years below age or grade level due to English being a foreign language for them. In this test students were asked to read the texts silently and answer the multiple-choice questions about them that required both factual understanding of text and inferential thinking. Background knowledge was not required to answer the questions. This task is presented in Appendix H.

5.3.3 Phonological awareness task

Rosner's Auditory Analysis Test (Rosner and Simon, 1971; henceforth Rosner's AAT), a phoneme segmentation-deletion task which is quite widely used in the literature, was chosen to asses the phonological processing skills of the students. This test consists of 40 English words varying in length from one to four syllables, and includes both syllable and phoneme deletion. The difficulty level of the task increases progressively; that is, the test starts with easy, short and frequent words like *carpet*, *smile*, and *break*, but it gets more and more difficult due to the longer and less frequent words increasing in number towards the end of the test such as *philosophy*, *continent*, and *clutter*. Participants were asked to say a word and then to repeat it without one of its sounds:

[7] The questions of this exam have been released to the public by the Norwegian Directorate for Education and Training on the following website: https://pgsc.udir.no/kursweb/pgsUser?marketplaceId=624075andlanguageId=1andmethod=previewTestandcontentItemId=2353916 (last accessed on May 10, 2010).

[8] The whole sample exam can be downloaded from the following hyperlink: http://www.udir.no/upload/ENG1002%20Eksempel%20H06%20E.pdf (last accessed on May 10, 2010).

(3) The voice in the recording: Say “lend”.
The student: “lend” (the expected correct response)
The voice in the recording: Now say it again without the sound /l/.
The student: “end” (the expected correct response)

(4) The voice in the recording: Say “carpenter”.
The student: “carpenter”. (the expected correct response)
The voice in the recording: Now say it again without /pen/.
The student: “carter”. (the expected correct response)

This task asks the subjects to delete syllables or phonemes from the initial, medial and final positions in each word. In total there are 28 phoneme and 12 syllable deletions. With three exceptions, the elimination of the designated phonological unit from the test item results in another English word when pronounced, as can be seen from the examples above.

The test items were pronounced and recorded by a male native speaker of English. The recordings were transferred to a PC and edited in the sound editing software GoldWave (www.goldwave.com, last accessed 11 December 2009). The participants listened to the test stimuli played on a lap-top computer through headphones and spoke into a 24bit Wave/MP3 recorder. Prior to testing, an example recording of a female voice performing the practice trials was played to each student, and then the student practiced the same items herself/himself. At the end of this trial session, the real test started. Testing was terminated by the author after the student failed to delete the correct sound in four consecutive words. This task has a reported Cronbach’s alpha of .90 (Siegel, 2008), which implies that this measure has a high level of internal reliability.

5.4 Procedure

All testing was done by the author between mid-January and late February in 2010. All participants were tested in their respective schools within school hours, except for one who took the tests at the University of Tromsø. The phonological awareness test was given to each student individually in a quiet room. The morphological awareness and the reading comprehension tasks were self-paced with no time constraints placed on the participants.

They were conducted in a group setting, again except for the student mentioned above. The tasks were administered in a fixed order. First, paper-and-pencil tasks: Derivational Suffix Test (real-word version), Derivational Suffix Test (pseudoword version), Reading Comprehension Task, and then the oral task: Phonological Awareness Test. The reason why the students were given the real-word version of the morphology test before the pseudoword version was that it was assumed that the real-word version would facilitate students' understanding of the nonsense-word version of the test. The same scoring procedure was used for all the tests applied in the study; students were given one point for each correct response and zero points for each incorrect answer (or no answer).

6. RESULTS

The results were analyzed according to the question they aimed to answer, namely in two main ways. First, in order to answer how dyslexics differ from non-dyslexics in terms of their performance on the tasks, the mean number of correct responses on each test was calculated and then an independent-samples *t*-test was conducted to determine whether there were significant differences in performance on the tasks for these two groups (sections 6.1-6.3). Second, to examine the relationship between morphological awareness and other language and literacy skills, correlations were computed for the dyslexic and the non-dyslexic group separately (section 6.4). However, it has to be recognized at the outset that, due to the small sample sizes, conclusions which can be drawn and comparisons which can be made here are limited. Table 1 summarizes the descriptive statistics of dyslexic and control students' performance on all of the tasks administered in the study.

Table 1. Summary of the mean performance of subjects on assessment measures. Standard deviations are in parentheses.

Variables	Dyslexics (n = 13)	Chronological-age Controls (n = 13)
Phonological Awareness Test *(40)*	17.23 (8.94)	31.23 (4.10)
Morphological Awareness Test		
Real Words *(10)*	6.38 (2.14)	9.46 (0.87)
Pseudowords *(10)*	4.08 (1.38)	8.15 (2.57)
Reading Comprehension Test *(20)*	10.54 (4.66)	18.23 (1.30)

Note: Italicized numbers represent the number of correct items possible.

6.1 Comparison of the groups' performances on the Phonological Awareness Test

As can be seen from the table above, the means for the Rosner's AAT indicate that non-dyslexics, as expected, outperformed dyslexic students on this task. The difference between dyslexic and non-dyslexic scores was statistically significant, $t(24) = -5.128$, $p < .001$. For example, the test item which required subjects to delete /w/ from the word *swing* was answered correctly by twelve of the thirteen control students, while there were only three dyslexic students who managed to omit this sound correctly.

As suggested by the standard deviations in Table 1, the control group showed relatively larger within-group variation on this measure than on the other tests. However, the majority of their scores clustered between 29 and 34, as illustrated in Figure 1. Unlike the other tests, no ceiling effect (earning the maximum score possible on a given subtest) was observed in control students on this test.

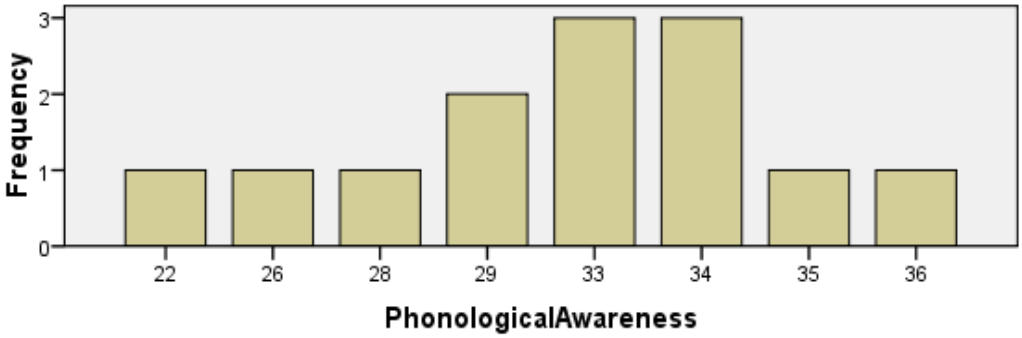

Figure 1. Bar chart showing the distribution of non-dyslexic students' scores on the Phonological Awareness Test (n = 13)

Compared to the control group, there is a much wider range of performance within the dyslexic group in terms of phonological awareness, as seen in Figure 2. Despite an overall poor performance, five of the students with dyslexia scored almost as well as their non-dyslexic peers. None of the participants in this group gave up the test without trying to pronounce the test items, though two of them with the lowest scores openly expressed that the task was too difficult for them. While the lowest score, 2, might indicate a kind of floor effect (earning the minimum score possible on a given subtest), there was no sign of ceiling effect in this group of students, as expected.

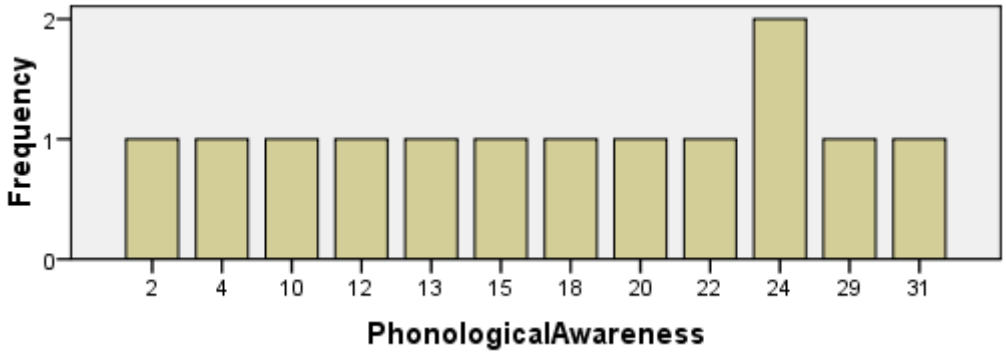

Figure 2. Bar chart showing the distribution of dyslexic students' scores on the Phonological Awareness Test (n = 13)

Although the participants with dyslexia more often and to a greater extent failed to delete phonemes and syllables from words correctly than did their typically achieving counterparts, a

closer examination of errors made by the two groups revealed a somewhat similar pattern in their performance. The first two words (*birth(day)* and *(car)pet*), requiring students to delete a syllable, were among the easiest test items pronounced correctly by all non-dyslexic and by most of the dyslexic students.[9] Similarly, phoneme deletion in shorter and more common words such as *bel(t)*, *(g)ate* and *plea(se)* proved to be considerably easier for both groups. The position of the sound to be deleted (initial, medial or final) seemed to affect the error performance of the participants only slightly, with the elimination of a medial phoneme being more taxing for students of both groups. Interestingly, there were more students (10 controls, 5 dyslexics) in both groups who managed to delete the medial syllable in *cr(e)ate* than students (6 controls, 2 dyslexics) who deleted the medial phoneme correctly in *c(l)utter*.[10] At this point, one might think that for the students in this study syllables could be, at least to some extent, easier to delete than phonemes. Yet this is not the whole picture. It seems that all subjects showed a tendency to make more errors when asked to omit a syllable from a longer and less frequent word such as *lo(ca)tion*, *Es(ki)mo*, *phi(lo)sophy*. The word *phi(lo)sophy* was the only test item for which none of the students with dyslexia obtained a positive score. And there were only three control students who performed the elimination of the specified syllable in this lexical item correctly. While some of the students (both in dyslexic and non-dyslexic groups) attempted to pronounce the remaining word as */fiosofi/* or */fasafi/*, most of them did not attempt to perform the task at all.

Since the sound to be deleted in this word was a stressed syllable, one may speculate whether stressed syllables could be more difficult to omit compared to unstressed ones. Another multisyllabic word *car(pen)ter* might provide an answer to this question. Although not a stressed syllable, *(pen)* was the most demanding test item (among all the phonemes and syllables to be deleted) for the controls and one of the most demanding test items for the dyslexics. Only one student in each group succeeded in omitting this syllable correctly. Again, most of the students in both groups made no attempt to delete this sound. The most common incorrect responses were */karəntər/* and */karpənər/*. Considering these results together, the following appears to be the case for the subjects in this study: Individual sounds in medial position were relatively difficult to omit for both groups. Students tended to be able to delete syllables with more ease than phonemes, provided that the word in question was

[9] The phoneme (or syllable) to be deleted is given in parentheses.
[10] Rosner and Simon (1971) divided the test items into seven different categories. The verb 'cr(e)ate' is included in the seventh category: *Omission of a medial syllable*.

relatively shorter and more frequent. However, it was equally challenging to delete a syllable from a multisyllabic word. Not surprisingly, the more syllables a word had, the more difficult it was to process for these students. However, the dyslexic students were clearly affected by this factor to a far greater degree than the students in the control group.

6.2 Comparison of the groups' performances on the Morphological Awareness Tests

Inspection of the means (see Table 1) for the two morphological awareness tests clearly indicate that, as predicted, control students did much better on both tests than did dyslexic students (real-word version $t(24) = -4.792$, $p < .001$; pseudoword version $t(24) = -5.027$, $p < .001$). Again, as expected, the majority of the subjects (except for one in the control and four in the dyslexia group) scored higher on the real-word version of the test than on the other version. The prediction that the performance gap on the two morphology tasks would be narrower in the control group than in the experimental group was also confirmed. The mean differences between the two test scores for controls and dyslexics were 1.31 points ($t(12) = 2.062$, $p = .062$) and 2.3 points ($t(12) = 3.094$, $p < .05$), respectively.

Since the same test materials were used for both dyslexic and control subjects, task difficulty was an uncontrolled confounding factor in the study. As a result of this, some of the control students' performance was found to be at ceiling on both of the morphology tasks (see Figures 3 and 5 – subject numbers are indicated in each bar). On the other hand, as expected, none of the students in the dyslexia group reached ceiling on either of these tasks (see Figures 4 and on the next page).

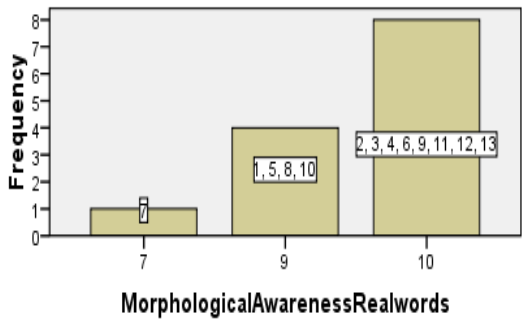

Figure 3. Bar chart showing each non-dyslexic student's score on the Morphology Test (Real-word version)

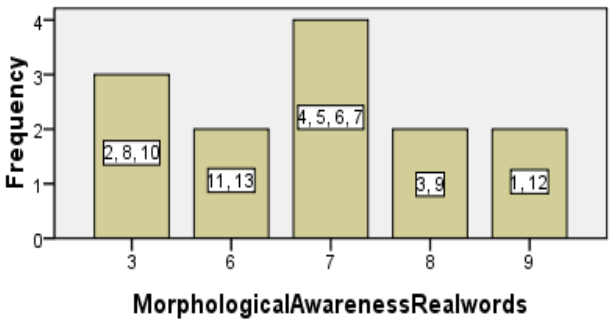

Figure 4. Bar chart showing each dyslexic student's score on the Morphology Test (Real-word version)

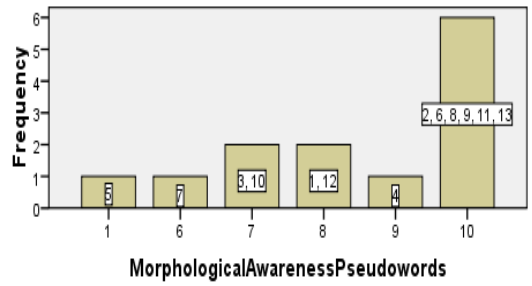

Figure 5. Bar chart showing each non-dyslexic student's score on the Morphology Test (Pseudoword version)

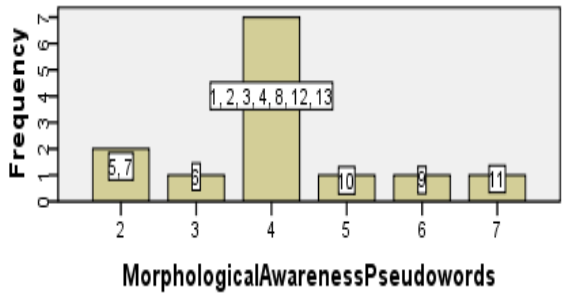

Figure 6. Bar chart showing each dyslexic student's score on the Morphology Test (Pseudoword version)

A further examination of the data presented in Figures 1-6 may also show whether there was a parallelism between the two scores that each subject achieved on the real-word and the pseudoword tests. A high degree of parallelism seems to be the case particularly for those of the control students who performed at ceiling or near ceiling in both tests. For example, the majority of the control subjects (1, 2, 4, 6, 8, 9, 11, and 13) who scored well on the real-word test also scored well on the nonsense-word test. However, dyslexic students' performances on these two tasks do not seem to have a clear pattern of parallelism. For example, the dyslexics (1 and 12) who scored quite well on the real-word test did not achieve high scores on the pseudoword test. At this point, it should be recognized that, since both tests were in multiple-choice format, these results are far from being unaffected by (among other things) some chance factor.

The pattern of performance observed in the non-dyslexic subject 5 is also worth noting. Despite performing at near ceiling level on the real-word test, she performed just slightly above floor level on the pseudoword test. Such a result can be interpreted in two ways: either this student's explicit knowledge about derivational suffixes was very low, or she simply did not understand this version of the test, which consisted of nonsense words.[11] However, due to the fact that all the subjects in this research are second language acquirers of English and that recognizing derivational suffixes in nonsense words compared to real words demands more abstract thinking, it is quite likely that not only students with dyslexia but also students without a reading disorder might lack the knowledge of suffixes to a considerable extent. Actually, some of the subjects in both groups expressed, without having been asked, that the non-word morphological test was quite challenging for them.

[11] After giving the instructions (in both English and Norwegian), I asked each student whether he or she had a question about the test. None of them, including student 5, required extra clarification.

Of particular interest to the study was to investigate whether certain types of derivational suffixes were more difficult to process for the subjects (e.g., noun vs. adjective). To this end, an item analysis was conducted on both morphology tasks. Table 2 and Table 3 below present the percentage of correct responses for both groups of participants on each type of suffix that was tested on the morphological awareness tests.

Table 2. The mean percentage correct responses for dyslexics and controls on nominal, verbal, and adjectival suffixes (Real-word version)

	Dyslexics	Controls
Noun Suffixes		
-ion	100 % (13/13)	100 % (13/13)
-ity	92.31% (12/13)	100 % (13/13)
-ist	53.85% (7/13)	100 % (13/13)
-ness	69.23% (9/13)	92.31% (12/13)
All:	**78.84%**	**98.07%**
Verb Suffixes		
-ate	76.92% (10/13)	100 % (13/13)
-ize	46.15% (6/13)	100 % (13/13)
-ify	7.69% (1/13)	61.54% (8/13)
All:	**43.58%**	**87.18%**
Adjective Suffixes		
-ous	61.54% (8/13)	92.31% (12/13)
-al	69.23% (9/13)	100 % (13/13)
-ive	61.54% (8/13)	100 % (13/13)
All:	**64.10%**	**97.43%**

Note: The numbers in parentheses indicate the number of students (out of 13) who provided the correct response to each test item.

Table 3. The mean percentage correct responses for dyslexics and controls On nominal, verbal, and adjectival suffixes (Pseudoword version)

	Dyslexics	Controls
Noun Suffixes		
-ion	61.54% (8/13)	76.92% (10/13)
-ity	30.77% (4/13)	69.23% (9/13)
-ist	61.54% (8/13)	92.31% (12/13)
-ness	46.15% (6/13)	92.31% (12/13)
All:	**50 %**	**82.69%**
Verb Suffixes		
-ate	46.15% (6/13)	92.31% (12/13)
-ize	38.46% (5/13)	84.62% (11/13)
-ify	7.69% (1/13)	76.92% (10/13)
All:	**30.76%**	**84.61%**
Adjective Suffixes		
-ous	38.46% (5/13)	76.92% (10/13)
-al	53.85% (7/13)	92.31% (12/13)
-ive	23.08% (3/13)	61.54% (8/13)
All:	**38.46%**	**76.92%**

Note: The numbers in parentheses indicate the number of students (out of 13) who provided the correct response to each test item.

As can be seen from Table 2, the overall performance pattern of the groups was similar on the real-word test. Both dyslexics and non-dyslexics found noun suffixes (operat*ion*, personal*ity*, activ*ist* and bright*ness*) easier to process than verb (demonstr*ate*, fertil*ize*, and grat*ify*) and adjective suffixes (industri*ous*, identic*al*, and product*ive*). Note, however, that there were noteworthy differences in dyslexic students' performance on all three types of suffixes, whereas control students' performance on nominal suffixes differed by only a nuance from their performance on adjectival suffixes. The nominal suffix *–ion* was the only suffix which seemed to be mastered by all subjects. Among the verb-making suffixes, *-ify* was the most difficult one to recognize and select correctly for the students in the study.

As for the pseudoword test, the data in Table 3 indicate that dyslexic participants' average performance on this test was consistent with their performance on the real-word test. In other words, the items with verb suffixes (curfam*ate*, script*ize*, and rom*ify*) constituted the most challenging part of both the real-word and the pseudoword tests, followed (in order of decreasing difficulty) by the items with adjective (tribaci*ous*, lori*al*, and dant*ive*) and noun suffixes (sufflat*ion*, brinic*ity*, cicar*ist*, and frood*ness*). Interestingly, all but one subject in the dyslexia group failed to choose the right item with the verb suffix *–ify* on both tasks, and it was not the same subject that provided the correct response on both of these tasks. When it comes to the control subjects, dealing with nonce words seemed to reverse their overall performance pattern that they showed on the real-word test. That is, they found verb suffixes easier than noun and adjective suffixes on the pseudoword test, and this was contrary to what was observed on the real-word test. A further point that could be made about the error pattern of the participants on this task is that the most challenging suffixes were the same for both groups. Put differently, the noun suffix *–ity*, the verb suffix *–ify*, and the adjective suffix *–ive* were the most taxing ones for both of the groups in the study. Based on these item analyses, it might be suggested that neither dyslexic nor non-dyslexic students' mean percentage of correct responses on adjectival suffixes reached the highest percentage value on either test compared to the mean percentage correct on nominal and verbal suffixes. Unlike the real-word test, there was no suffix that was recognized correctly by all subjects on the pseudoword test. Similar to the results of the phonological awareness test, dyslexic subjects failed to a much greater degree than control students on the pseudoword test, but the characteristics of their errors were qualitatively similar to those of control students.

6.3 Comparison of the groups' performances on the Reading Comprehension Test

As was the case on the previous tests, the dyslexics scored significantly below their chronological-age matched peers on this test ($t(24) = -5.726$, $p < .001$). Since there was no time limit for this test, the time taken by the subjects to perform it was not recorded. Yet, it was observed that most of the non-dyslexic students completed the test in approximately 20-25 minutes, but the majority of the students with dyslexia needed almost twice as much time to finish it.

Although there was only one student who achieved the maximum score in the control group, it is obvious from Figure 7 that, as hypothesized, this test was quite easy for non-dyslexic students. An error analysis was undertaken to see whether any of the questions were more difficult for this group. According to this analysis, the majority of the questions (17 out of 20) were answered correctly by at least eleven of the thirteen students in this group. Question 5 (asking the main point of a story) was answered correctly by nine control students and seemed relatively difficult (see Appendix H). Considering that this question required students to make inferences, it can be proposed that such questions might be less easy to comprehend and provide the correct answer to for at least some of the students in the control group. However, there was actually no clear difference to mention between the reading comprehension questions in terms of their difficulty level, since most of the students in this group performed at near ceiling level.

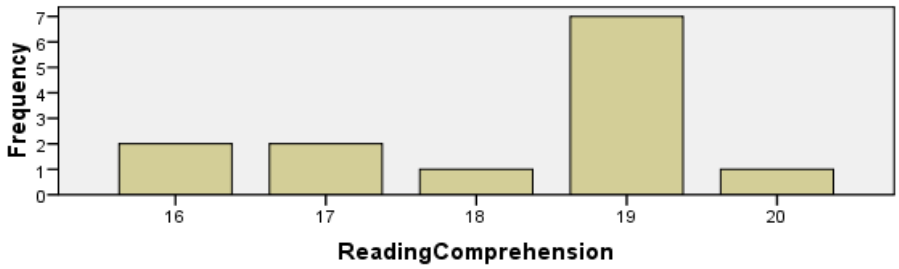

Figure 7. Bar chart showing the distribution non-dyslexic students' scores on the Reading Comp. Test (max score = 20)

As predicted, the dyslexia group in general had more difficulty in their ability to answer questions correctly on this task in comparison with the control group. However, as again expected, there was a striking individual variation in this group of students (see Figure 8). This result may be in part due to the fact that some of the dyslexic students at this grade level are able to build compensatory strategies to overcome their decoding problems, while some of

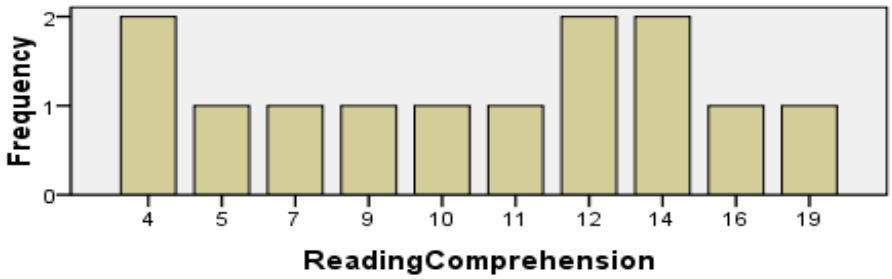

Figure 8. Bar chart showing the distribution of dyslexic students' scores on the Reading Comp. Test (max score = 20)

them fail to develop such effective strategies. For example, as discussed in previous chapters, knowing about morphological affixes may enable dyslexic readers to decode and understand unfamiliar words in a text, and having or not having this kind of knowledge may account for the variance in this sample. We will come back to this relation in the next section. It is also reasonable to assume that some, but not all, of the dyslexics in this study might be aware of various well-known reading comprehension strategies such as skimming, scanning, reading for the main idea, etc. This factor may also have contributed to the high within-group variation observed in this group.

As for the question whether dyslexic students found any questions on this task more difficult than others, an analysis of subjects' errors showed that the questions varied markedly in their overall difficulty for the participants in this group. Question 10 (asking the reason why the main character in the story hesitated to join one of the groups preparing for a fight) and question 19 (asking the synonym of the word "expensive") were the hardest questions, which were answered by only two students. On the other hand, question 2 (asking about a piece of information stated very clearly in the passage) was the easiest one, answered correctly by ten of the thirteen dyslexic students (see Appendix H). An interesting point is that most of the dyslexic students, like some of the non-dyslexics, had problems finding the correct answer to questions requiring the reader to go beyond what was stated in the text (e.g., question 10). However, it is not surprising that question 2 proved to be quite easy for the majority of dyslexic students, given the length and the difficulty level of the text on which this question was based.

To sum up the comparisons between the groups in the study, we can conclude that, as hypothesized, all the variables tested in this study were able to differentiate the two groups of students at a statistically significant level ($p < .001$). As predicted, the reading comprehension

and the real-words tests were easier for both groups. However, the pseudowords test appeared to be more challenging than the phonological test for the dyslexic group, while the phonological awareness test was more difficult than the pseudowords test for the non-dyslexic group (see Table 4 below). In short, our first hypothesis that control students may outperform experimental students on all language tasks is borne out by the data.

Table 4. Mean percentage of accuracy for the dyslexic and the control groups

	Reading Comprehension Test	Phonological Awareness Test	Morphological Awareness Test	
			Real-words	Pseudowords
Mean percentage for the D group	**52.69%**	**43.07%**	**63.84%**	**40.76%**
Mean percentage for the C group	**91.15%**	**78.07%**	**94.61%**	**81.53%**

Note: The initials D and C stand for the terms 'dyslexic' and 'control', respectively.

6.4 Relationships among morphological awareness, reading comprehension and phonological awareness skills

The second research question was about the relationship between students' morphological awareness ability and their skills in the other two language and literacy tests. To address this question, two sets of Spearman correlations were run for all variables. The first correlation matrix was done for the dyslexic group and the second for the control group. Both matrices are displayed in Table 5. Note that the numbers in bold in the top row represent the variables listed to the left in the table:

Table 5. Correlations (Spearman's rho) among measures administered in this study

Variables		**1**	**2**	**3**	**4**
1. Phonological Awareness	*Correlation coefficient*	-	.388	.316	.235
	Sig. (2-tailed)		.191	.294	.439
2. Morphological Awareness	*Correlation coefficient*	.344	-	.589*	.320
(real-words)	*Sig. (2-tailed)*	.250		.034	.286
3. Morphological Awareness	*Correlation coefficient*	-.355	-.153	-	.530
(pseudowords)	*Sig. (2-tailed)*	.234	.617		.063
4. Reading Comprehension	*Correlation coefficient*	.278	.572*	-.425	-
	Sig. (2-tailed)	.358	.041	.148	

Note: The lower left triangle represents the dyslexic students only (n = 13); the upper right triangle represents the controls (n =13) only.
*. Correlation is significant at the 0.05 level.

As shown in Table 5, the majority of correlations can be classified as weak to moderate in magnitude and are statistically non-significant, possibly due to the small sample size of the two groups used in the study. Though some of them have high p-values, the correlation coefficients of primary interest are mentioned in the analyses below.

The bottom left half of Table 5 demonstrates that the reading comprehension and the morphological awareness (real-word version) measures were moderately correlated at a significant level with each other in dyslexics. And as hypothesized, this correlation was positive and stronger than the correlation between the reading comprehension and the phonological awareness tests. In contrast, the hypothesis stating that the reading comprehension test would be positively and more strongly related to the morphological awareness test (pseudoword version) than to the phonological awareness test received only partial confirmation. There was a much higher, albeit statistically insignificant, association between the reading comprehension and the pseudoword tasks, but the direction of the correlation was negative – the opposite of our expectation. This less expected result found in dyslexics suggests that low scores on the pseudowords task tend to go with high scores on the written text comprehension task for this group of students. In other words, the lower a dyslexic subject's score on the pseudoword morphological test, the higher his or her score on the reading comprehension test.

As for the control students, a review of the rightmost column in Table 5 indicates a pattern of correlations for them which is in a sense similar to what was observed in dyslexics. As

predicted, the correlations between both of the morphological awareness tests and the reading comprehension test were positive and larger than the correlation between the phonological awareness and the reading comprehension tests. Unlike the case observed in the dyslexic group, reading comprehension seemed to be more closely associated with the pseudoword test in comparison with the real-word test in control students. This result may stem from the fact that the real-word version of the morphology task proved to be very easy for almost all of the students in this group. Although none of these correlations reached the .05 level of significance, a more important finding shows that there was a clear trend (.063) towards a significant relationship *only* between the pseudoword and the reading comprehension scores of the students in this group.

An alternative hypothesis that phonological awareness may have a positive and stronger association with reading comprehension in dyslexic students than in control students was also proposed in chapter 4. The data reported here do not appear to fully support this suggestion as the correlations between these two variables were statistically insignificant and almost equally weak in both groups. Although not specifically part of the hypotheses, there are two other correlations in Table 5 that are worth mentioning, namely the correlations between the two morphological awareness tests. The data point to a very weak, insignificant and inverse correlation between dyslexics' scores on these two tasks, suggesting that dyslexic subjects might have treated the real and the nonsense test items differently. In contrast to this pattern observed between dyslexics' scores, the correlation between non-dyslexics' scores on the two morphology tasks was positive and, more importantly, the largest and the most significant of the correlations presented in Table 5.

To recapitulate, we found reading comprehension skills to be more closely correlated with morphological awareness (assessed by the real-word and the nonsense-word tests) than with phonological awareness in both the dyslexic and the control group, lending support for a stronger relationship between morphological awareness and reading comprehension than between phonological awareness and reading comprehension (Hypothesis 2). However, most of these correlations are statistically insignificant. Therefore, it has to be stated clearly that the analyses reported here are only the general interpretations of the data obtained in the current study and not intended to generate inferences that could be applied to other populations, either dyslexic or non-dyslexic.

7. DISCUSSION

The primary aim of this thesis has been to examine the morphological awareness skills of eleventh grade students with developmental dyslexia and the degree of association between morphological awareness ability and the two other language skills, namely written language comprehension and phonological awareness. The dyslexic group's performance was compared with that of an age-matched control group. Although this study is small-scale and exploratory rather than definitive, the results it yielded are generally consistent in several respects with previous research studies, as will be argued below.

In what follows we analyze the results of the overall performance of the dyslexic and non-dyslexic subjects and compare them with the results of similar studies (section 7.1), and then we discuss the interplay among morphological awareness, phonological awareness, and reading comprehension with respect to previous findings (section 7.2). The chapter ends with a summary (section 7.3).

7.1 The patterns of performance of the study groups

As we saw in the previous chapter, the dyslexic group had significantly lower scores on the Rosner's AAT relative to their typically-developing peers. This finding, that dyslexic students have severe difficulties with phonological processing, was not unexpected in view of the previous evidence of phonological awareness problems and verbal short-term memory deficiencies, which are common features of the dyslexic condition (Crombie, 1997; Siegel, 1999; Sparks and Ganschow, 1993b; chapter 1). However, similar to the results reported in Rosner and Simon (1971), longer words like *car(pen)ter*, *lo(ca)tion* and *phi(lo)sophy* were quite hard to segment for normally achieving students as well, since this type of words puts an additional strain on short-term memory.

Also the result that both dyslexic and non-dyslexic students found the test items requiring syllable deletion (as in *(car)pet* and *cr(e)ate*) less difficult than the items requiring phoneme deletion (as in *c(l)utter*) was convergent with the previous data indicating that it is easier to segment words at the level of syllable rather than the phoneme (Treiman, 1986). A possible

explanation for phonemic awareness being more difficult than syllabic awareness is that phonemes, unlike syllables, rarely exist independently. That is, the articulation of a given phoneme depends on both the preceding and following phoneme, whereas a syllable exists as an independent phonetic entity (Beaton, 2004), and this might have caused phonemes to be relatively less easy than syllables to process

On both of the morphology tests, control students did much better than the dyslexic students, and as anticipated, both groups performed better on the real-word morphological task than on the pseudoword test. The low accuracy of the dyslexia group provides support for the finding that English morphology is a specifically difficult area for Norwegian dyslexics acquiring English as a second language (Helland and Kaasa, 2005; section 2.2). This result also replicates that of Siegel (2008), who used exactly the same real-word and nonsense word materials as the present study to investigate the morphological awareness skills of dyslexic and non-dyslexic sixth grade students acquiring English as L2 in Canada. The mean score for the non-dyslexic sample in her study was 9.29 (*SD* = 1.21) on the real-word and 7.40 (*SD* = 2.31) on the pseudoword test. Similarly, the mean scores on the real-word and the nonce word tests for the non-dyslexics in the current study were 9.46 (*SD* = 0.84) and 8.15 (*SD* = 2.47), respectively. The mean scores on the real-word and the pseudoword tests for the samples with dyslexia were, respectively, 6.38 (*SD* = 2.42) and 4.31 (*SD* = 2.09) in Siegel's and 6.38 (*SD* = 2.05) and 4.07 (*SD* = 1.32) in this work. Therefore, these results of the present study render further support to the findings of previous research which suggest that individuals with dyslexia generally have a lower sensitivity to the internal structures of words when compared to same-age skilled readers (e.g., Champion, 1997; Chung *et al*., 2010; Coleman *et al*., 2009; Leong, 1999; section 3.5).

The finding that typically developing high school students in the study scored globally lower on the pseudoword test than on the real-word task is in line with that of Nagy, Diakidoy and Anderson (1993), who measured eleventh and twelfth grade American students' knowledge of ten common derivational suffixes (*-able*, *-ize*, *-er*, *-ful*, *-ness*, *-ist*, *-ism*, *-less*, *-ish*, *-ly*) with a multiple-choice test based on rarely-occurring derivatives of familiar stems (e.g., cheesish, orangeness, mirrorize). The authors reported that, even in high school, most students did not do well on this derivational suffix test. They took this result as an indication of students' failure to use the syntactic cues provided by the suffixes, and argued that a possible reason why derivational suffixation was not mastered by all students might be the relative

abstractness of the information conveyed in derivational suffixes. The results from these two studies suggest that awareness of common English suffixes, at least in some students, is not complete even at high school level and therefore that this kind of awareness might continue to grow through high school.

With regard to the performance of the study groups on each type of suffix tested on the morphological awareness tasks, the current results show that the real-word morphology test was too easy a task to separate out the differences among control students in terms of their knowledge of derivational suffixes. The only noteworthy difference was that the test item including the verb *gratify* was relatively difficult. It was answered correctly by eight students, whereas the other real-word test items were answered by either twelve or thirteen students in the control group (n = 13). However, a review of these five students' errors on this test item revealed that they all in fact chose another alternative which was again a verb, though incorrect, namely *demonstrate*.[12] It is, therefore, reasonable to suppose that although these students might be uncertain of the meaning of the verb *gratify*, they were at least aware that this task item required a verb, since they did not choose the other two items, i.e. *gratuity* and *grateful*. On the pseudoword version of the morphology test, there were three control students who failed to answer the test item requiring the verb suffix *–ify*. Interestingly, it was again three of these five students who failed to select the correct alternative (i.e., *romify*) on this version too. The other two students, who provided the correct response on the nonsense word test, but not on the real-word test, seem to have, aside from chance, the tacit knowledge that this suffix (i.e., *–ify)* denotes a verb, as opposed to a noun, adverb or adjective.

Considering the data indicating that the other verbal suffixes, *–ate* and *–ize* were answered correctly by all control students on the real-word test, and respectively, by eleven and twelve students on the pseudoword test, we can conclude that *–ify* was the most challenging verb suffix for some of the students in this group. Actually, *–ify* was the most difficult suffix for the dyslexia group as well. It has been proposed that developing sensitivity to morphemes (viz., morpheme awareness) may depend on exposure to those morphemes in different contexts (Carlisle and Stone, 2005). From this proposition, we can speculate that the students in this study may have less frequently encountered the verbs ending with *–ify* in comparison

[12] It might be argued that, although not as suitable as the verb *gratify*, the answers including *demonstrate* could also be scored positively. However, it should be noted that only the answer which fit best into the sentence was given a positive score.

with the other verbs ending with *–ate* and *–ize*, and they may, accordingly, be less sensitive to this suffix than to the other two suffixes. Also, differing levels of exposure to these morphemes in print may have caused differences in these subjects' orthographic knowledge, which, in turn, may have contributed to the variability in morpheme recognition. It is worth noting that to encounter a word frequently is not the same as that word being a high-frequency word. The point that I attempt to highlight here is that since the subjects in the present study were high school students, it is very likely that they are exposed to many low-frequency words in printed English both at school and outside school and that the amount of this exposure may vary from student to student. Therefore, although frequency is quite an important factor, it might not be very safe to assume that the frequency of the verbs ending in *–ify* alone would be the only decisive factor in these students' (dyslexic and non-dyslexic) developing awareness to this suffix. Rather, it may be assumed that the frequency of these words and how frequently an individual student encounters them together play a role in acquiring awareness of morphemes.

As already reported in the previous chapter, the most difficult three suffixes on the pseudoword test (i.e., *-ity*, *–ify*, and *–ive*) were the same for both the dyslexia and the control group. The argumentation given above as to why the verb-building suffix *–ify* was relatively more difficult for the subjects to recognize could apply to the other two suffixes as well. In addition to these two factors (i.e., repeated print exposure, orthographic knowledge), a number of other factors concerning morpheme recognition have been identified in the literature. Linguistic complexity (neutrality) of suffixes is one of them. Without going into a detailed discussion of their characteristics, I will just mention that in the literature suffixes are classified into two types; neutral and non-neutral. The first type, which does not cause phonological or orthographic changes in the word to which they are added (e.g., *own* + *–er* -> *owner*), has been suggested to be easier to process than the second type, which alters the phonological or orthographic form of the stem (e.g., *receive* + *–ion* -> *reception*) (Carlisle, 2000; Champion, 1997; Mahony, Singson and Mann, 2000; Tyler and Nagy, 1989). Looking at the pseudoword test items ending in nominal and verbal suffixes (adjectival suffixes were all non-neutral: *–ous*, *–al*, and *–ive*), it appears that students generally tended to fail on the test items ending with non-neutral suffixes (e.g., *–ify* vs. *–ate* and *–ity* vs. *–ist*). However, another result from this test revealed that the participants of the dyslexic group recognized the non-neutral suffix *–ion* more easily than the neutral suffix *–ness*, and actually, this was also the case on the real-word test for these students. Although the assumption that the neutrality of

suffixes might affect morpheme recognition may hold some truth for our subjects too, it seems inadequate to explain all the errors students made on the morphological awareness tests. This finding is comparable to that of Tyler and Nagy (1990), who found no differences between neutral and non-neutral suffixes as far as students' knowledge of syntactic function of these suffixes was concerned.

With regard to the relative ease of the non-neutral suffix *–ion*, we might suspect that students' better performance on the nonsense word *sufflation* as well as on the real word *operation* might be due to this suffix (and also the word *operation*) being one of the cognates that Norwegian and English share. There is actually some empirical evidence concerning the facilitating role of cognates in enhancing the transfer of morphological awareness between L1 and L2 (Ramírez Gómez, 2009); however, no systematic investigation of this factor was undertaken in the current study.

A relatively more important point to consider with respect to the results of the pseudoword task is that the dyslexic group exhibited a similar pattern of performance to that of their chronological-age peers in terms of the errors they made on this version of the morphology test. This aspect of the results might lend support to the argument that poor readers' difficulties with phonological complexities of derived forms may be "a matter of degree, not kind", since normally achieving readers also have more difficulty processing forms with such complexities than processing transparent forms (Carlisle, 2003; section 3.5). This finding may also indicate that morphological processing is not absent in these dyslexics; however, as argued by Casalis *et al.* (2004; section 3.5), they may develop knowledge about derived words (i.e., morphological awareness skills) more slowly than their normally developing age peers. Dyslexics' difficulties with morphological processing might in general be due to the nature of the disability itself, which was discussed in detail in earlier chapters. We might also suppose that such problems could also, at least in part, stem from reduced reading practice and print exposure, since a common characteristic in many individuals with dyslexia is that they tend to avoid reading due to their literacy problems which make act of reading very burdensome for them (Høien and Lundberg, 2000; Siegel, 1999). In other words, reduced experience with print can be one of the reasons which may have prevented these dyslexic students in the present study from developing adequate knowledge of morphemes expected from their age and grade level.

Although there was a general similarity in the error pattern of the subjects on the derivational suffix tests, the dyslexia group differed markedly from the control group with regard to their awareness of verbal suffixes. Their performance on the test items requiring a verb-forming suffix was very poor on both versions of the morphological awareness test. On the basis of these data, we might suspect that English verbs and the conjugation of these verbs could be a potential problem area for the dyslexics in this study, and therefore it may be useful to direct additional attention to this problem while teaching English to students with dyslexia.

Similar to the results of Ghelani *et al.* (2004), who compared the written language comprehension skills of adolescents with reading disabilities to those of normally developing controls, our dyslexic adolescents performed more poorly than their age peers on the reading comprehension test. However, except for two students who scored 4 and one student who scored 5, their comprehension scores were generally average. Actually two of the dyslexics' scores (16 and 19) were well above the average performance of the group. As discussed in section 3.3, reading comprehension difficulties in dyslexia are viewed as secondary, a consequence of the poor single-word decoding (Høien and Lundberg, 2000). Many dyslexics, often due to increasing experience with print, learn to develop strategies, such as sight-word reading and relying on context more than their non-dyslexic peers. In this way, they might be able to compensate for their decoding deficits and comprehend written texts within normal or close to normal limits (Aaron, 1989; Nation and Snowling, 1998). However, it has also been reported that dyslexics can utilize such strategies successfully only in conditions such as untimed reading tests (Aaron and Joshi, 1992). With these previous findings in mind, we can propose that, since the test we used in this study to assess students' reading comprehension skills had no time limit, it is very likely that the average to above-average scores of the dyslexic students in the present study might be due to the various compensatory strategies they used to by-pass their word recognition deficiencies and comprehend the written texts.

Before moving to the next section, a last remark about the nature of the dyslexic students' performance on all the tasks employed in the study is in order. As we recall from section 1.4, sub-type classification of dyslexia is an undetermined issue, but on the other hand, it is widely accepted that dyslexics show large individual variations. In a similar vein, the analysis of the present test results revealed that the dyslexia group had a much greater within group variation than the control group. To put it another way, as demonstrated by the large standard deviations, they were more heterogeneous in terms of their achievement performance. As also

discussed in depth in the first two chapters of the study, there are many characteristics that are common to most of the dyslexics (e.g., problems with verbal short-term memory, difficulties with the retrieval of phonological information from long-term memory) (Snowling, 2004). Nevertheless, as emphasized in the definition of dyslexia adopted for the current study, the manifestation of the literacy problems dyslexics have will be determined by individual differences in cognitive areas as well as by the language being acquired (Smythe and Everatt, 2002). Therefore, it may be plausible to assume that the pronounced individual variation observed among dyslexic students might be due to the differences in their cognitive abilities, which have been attenuated to varying degrees by dyslexia. Furthermore, it might be proposed that this wide variation among the participants with dyslexia could be due to the fact that some of them may have received fairly intensive learning support for their Norwegian and English reading and writing skills, while others have received very little or no such help at all.

The reason could also be that English, an orthographically opaque language (sections 2.4 and 3.4), may affect the degree of dyslexic difficulties that these students have in both positive and negative ways. For example, when I asked each dyslexic student in the study whether it was any easier to read and write in English compared to Norwegian (cf. differential dyslexia, section 2.4), eleven of them said, as expected, that English was absolutely more difficult for them in all respects, whereas one of them said it was easier to write in English, but reading was equally troublesome for him in both languages. As for the last student's answer, it was quite surprising. She said that it was much easier for her to write and read in English than in her native language, Norwegian. According to her, it was definitely not an easy task to cope with three different versions of Norwegian, namely, *bokmål, nynorsk*, and the North-Norwegian dialect.[13] She thought English was in a sense "more standardized", which helped improve her reading and, in particular, her spelling skills. Also, she added that she was able to remember many more "whole words" in English than in Norwegian, which contributed to her making relatively fewer spelling mistakes in that language. At this point, it could be speculated that this student may have developed some compensatory mechanisms for the automatization of her word decoding skills, such as sight-word reading. This finding is coherent with that of Miller-Guron and Lundberg (2000), which reported some Swedish dyslexics who found it easier to read and write in English than in Swedish, even though

[13] Unlike several other countries, Norway has no official spoken standard. However, it has two official written languages: *bokmål* (which has developed from Danish) and *nynorsk* (which has developed from Norwegian dialects) (Almberg and Husby, 2000).

Swedish, a transparent language, was their first language. Conversely, it does not confirm the results of Kaasa (2001), which reported that none of the 20 dyslexic sixth and seventh graders found English less difficult than Norwegian. The data from the research conducted by Kaasa (2001) is actually not surprising, as the studies reporting individuals with differential dyslexia are relatively rare in the literature (Smythe and Everatt, 2004). Yet, this different finding may have been a result of her use of an experimental group consisting of dyslexics who were much younger and less experienced in the English language than the ones in Miller-Guron and Lundberg (2000) as well as the current study. It should, however, be emphasized that the argumentation given in this paragraph about the likelihood of observing differential dyslexia in some of the dyslexic participants in this study is not based on any experimental test results, but on the brief informal conversations that I had with each participant after the completion of the Rosner's AA Test session.

7.2 Relation between morphological awareness, phonological awareness and reading achievement

Another central issue in this study was the link between the subjects' reading comprehension outcomes and their morphological awareness and phonological awareness skills. To investigate this, we performed correlational analyses (Spearman's) between these task scores. If there is a correlation between two variables, then this might be taken as implying that these two variables are not independent of each other and that there is reciprocal influence between them. Although most of the correlations we found were in the low to moderate range and statistically insignificant (Table 5, section 6.4), presumably due to the small sample sizes, they may still give us a general idea of the nature of the associations between the test scores in our two populations.

Dyslexic students' scores on the real-word morphological awareness test were significantly and positively correlated with their reading comprehension scores (.572). Additionally, their performance on the pseudoword test was associated, though negatively, with their scores on the reading comprehension task (-.425). More importantly, both of these correlations were, as predicted, much larger than the correlation between the phonological awareness task and the reading comprehension test (.278), suggesting that in these dyslexic students, performance on the written text comprehension task might be more dependent on their morphological

awareness skills than on their phonological awareness ability (Hypothesis 2a). This result contradicts the assumption that sees the association between reading achievement and morphological awareness skills in poor readers as secondary to phonological abilities (Fowler and Liberman, 1995; Shankweiler *et al.*, 1995), whereas it concords with the result of Siegel (2008), which reports that dyslexic sixth graders' scores on the reading comprehension test were more closely related to the real-word test scores than to the pseudoword test scores. Siegel (2008) also reports that the correlations between the reading comprehension test and the two morphological awareness tests were much higher than the correlation between the reading comprehension test and the phonological awareness test. Interestingly, correlational analyses of the non-dyslexic scores on these four tests pointed to a somewhat similar pattern to that of dyslexic scores. That is, typically-developing participants' performance on the test assessing written text comprehension was also more strongly associated with their awareness of derivational suffixes (particularly with the pseudoword test – the opposite of what was observed in dyslexics) than with their phonological awareness skills (Hypothesis 2b), supporting the results of Nagy, Berninger and Abbott (2006), who found that eighth and ninth grade normally-developing American students' skills in reading comprehension showed a higher correlation with their morphological awareness (measured, among others, by a suffix choice test that was very similar to the morphology tests used in the present work) than with their phonological awareness abilities.

Taken together, these findings may suggest that our subjects' (both dyslexic and non-dyslexic) phonological processing skills might be less important for their performance in written language comprehension when compared to their morphological awareness abilities. Though their primary focus was not on the comparison of phoneme awareness with morpheme awareness in terms of their roles in individuals' literacy outcomes, some previous studies have actually found evidence that phonological skills, in general, gradually wane in importance both for dyslexics' (e.g., Ransby and Swanson, 2003) and typical readers' (e.g., Muter *et al*., 2004) performance in reading comprehension (section 3.3). Regarding the relation between phonological skills and reading achievement of mature individuals with and without a reading disorder, Scarborough *et al.*, (1998) state the following; "What the adolescent and adult data indicate (…) is that phonemic awareness may not always be necessary for successful reading (…) some individuals manage to become good readers without ever having attained a phonemic level of metaphonological skill" (p. 139). Recall also from section 3.4 that a strong developmental trend was observed in the relative contribution of

phoneme awareness and morpheme awareness to reading-related skills; that is, the role of phonological awareness in decoding (Singson *et al.*, 2000) and in reading comprehension (Carlisle, 2000; Kieffer and Lesaux, 2008) was found to decrease as the importance of morphological awareness in these skills increased steadily with age. Then, given the age of the participants in our sample (a mean of 17 years), this result does not seem surprising. Furthermore, this age-dependent role of morpheme awareness and phoneme awareness in individuals' literacy skills might seem to account for why the alternative hypothesis that phonological awareness may have a positive and stronger association with reading comprehension in dyslexic students than in control students was not supported by the present data. Also, the disparity between our result and those of Fowler and Liberman (1995) and Shankweiler *et al.* (1995) might in fact be due to the mean age of their samples, which was much younger than ours, 8;6 and 8;5 years respectively. However, caution must be exercised in suggesting that "the developmental trend hypothesis" mentioned above might hold true also for our subjects, since the study we report here is neither developmental nor cross-sectional in nature.

Our data have revealed some other correlations that warrant comment. One of them was the negative correlation between dyslexic students' low scores on the pseudoword test and their relatively better performance on the reading comprehension test. A point that was discussed in section 3.3, namely that dyslexics with poor phonological awareness may have trouble recognizing words that they have not encountered in print before (Beaton, 2004), might be a viable explanation for this result. Also, Aaron (1989) argues that the "frequency" and the "meaningfulness" of the words can affect dyslexics' words processing skills. Based on these arguments, the following proposal could be made: Since the words used in the pseudoword test were made-up words (e.g., *sufflation, cicarial, romify*), they had no frequency rate nor were they meaningful per se. Accordingly, dyslexic participants might have had problems decoding these lexical items properly, and thereby scored poorly on this test. On the other hand, they might have managed to get higher scores on the written text comprehension task because this test, unlike the pseudoword test, consisted of several different meaningful texts, which probably helped them benefit from some well-known compensatory mechanisms that we discussed above (e.g., whole-word sight reading strategy, relying on context, etc.).

Two other noteworthy correlations, for which I did not make any predictions in chapter 4 as they were not specifically part of the hypotheses, were the correlations between the two

morphological awareness tests. Dyslexic students' scores on these two tests were negatively and very weakly correlated. This result might be another indication of these students' specific difficulties with nonsense word reading, due to the reasons discussed above, since they were able to perform much better on the real-word test in general. As for the correlation between the non-dyslexic's scores on the two morphology tasks, it was not only positive, but also the largest (.589) and the most significant of all the correlations in the study. We may interpret this result to mean that these two tests were tapping a similar ability to deal with the syntactic aspects of derivational suffixes. Moreover, the high scores that control students obtained on these tests show that the suffixes tested here were within the grasp of the majority of these subjects.

7.3 Summary

The main findings of the research reported here can be summed up as follows:

The mean overall scores of dyslexics students on all the tasks administered were, as expected, significantly lower than those of control students (Hypothesis 1). However, as again predicted, not all subjects with dyslexia performed poorly on all the tests, as some of them managed to get as high scores as their normally reading peers, possibly due to the various compensatory strategies they have developed to circumvent the difficulties they face in dealing with language tasks. As a result, there was much larger within-group variation among dyslexic participants compared to controls, supporting the findings in previous literature that the cognitive abilities of these students could be affected by dyslexia to considerably varying degrees.

Although some of the correlations failed to reach the .05 level of significance, students' (both dyslexic and non-dyslexic) performance on the test assessing reading comprehension seemed to correlate more strongly with the morphological awareness tests than with the phonological awareness test (Hypotheses 2 a-b). The result implying a relatively weaker association between these students' written text comprehension skills and phonological processing abilities was similar to previous studies (e.g., Carlisle, 2000; Kieffer and Lesaux, 2008; Muter *et al*., 2004; Ransby and Swanson, 2003), which reported that the importance of phoneme awareness in reading comprehension performance of individuals (with or without a reading

disorder) decreased as the importance of morphological awareness increased steadily with age.

As for the dyslexic subjects' awareness of morphological structures, they seemed to have a much lower sensitivity to derivational morphology, suggesting that these students might have some specific problems with this domain of the English language. On the other hand, a common feature observed in the present results was that even though the participants with dyslexia failed on the tasks to a greater extent than their typically achieving counterparts, both groups exhibited a somewhat similar pattern of performance in terms of the errors they made on these tests, suggesting that in general, dyslexic subjects' errors on the test items in this study might seem to differ quantitatively rather than qualitatively from those of their typically developing peers. However, it should of course be stressed once again that, although the current results appear to provide us with some insight pertaining to the performance pattern of the students who volunteered to participate in this study, they may not generalize to other students (dyslexic or non-dyslexic) because of the relatively small sample sizes and the ceiling effects for the control group.

PART III: Closing Remarks

8. Conclusions

As we saw in Chapter 1, converging evidence indicates that dyslexia is a language-based learning disorder which is generally associated with reading, spelling and writing difficulties. It is independent of socio-economic or language background, and occurs despite normal intellectual ability and conventional teaching. The fundamental cause of dyslexia is suspected to be genetic in origin; however, data from the genetic investigations do not appear to provide a full account of dyslexia. There are currently three main explanatory theories as to the causes of the dyslexic patterns of difficulty; (a) The phonological deficit hypothesis, which proposes that reading problems of dyslexic children stem from a deficit in their phonological processing skills, (b) The magnocellular deficit hypothesis, which claims that literacy difficulties might originate in the magnocellular system, and (c) The cerebellar deficit hypothesis, which assumes that such difficulties arise in the cerebellum. Among these, the phonological deficit hypothesis has been the dominant descriptive framework for dyslexia during the late twentieth century. Despite the fact that most dyslexics suffer from similar problems, such as difficulties with verbal short-term memory or problems with single-word decoding, the severity of dyslexia will be determined by individual differences in cognitive areas and by the language being acquired. This fact has given rise to the question of whether there are any sub-types of dyslexia. While some researchers maintain that there do exist distinct varieties of developmental dyslexia, other researchers strongly disagree with classifying dyslexia into subtypes.

In Chapter 2, we looked at a number of difficulties that students with dyslexia may experience in acquiring a second language. Among these were problems with decoding, encoding and comprehending print at the levels of letter-sound, morpheme (prefixes, roots, suffixes with grammatical or semantic information), and syntax. Short- term memory problems also seem to play a major part in students' poor written and oral language performance. Regarding the question as to why it is troublesome for individuals with dyslexia to learn a foreign language, it has been proposed that one's native language skills has a decisive role in the success or failure of second language learning, due to the cross-language transfer between L1 and L2

(the Linguistic Coding Differences Hypothesis, Sparks and Ganschow, 1991). This means that if a person has language difficulties in his or her first language, it is very likely that this person will face similar problems while acquiring another language. Based on research studies, it has been suggested that using direct and explicit methods of instruction would be beneficial in teaching a second language to dyslexics. On the other hand, researches have also reported some cases of individuals who are dyslexic in one language, but not in another. To account for this phenomenon, it has been suggested that different languages may make different demands on the cognitive processing system. Therefore, even though the common assumption that language skills and deficiencies in L1 influence L2 is indeed often true, it would be wrong to take it for granted that all language problems dyslexics have in an L2 are always caused by poor proficiency in the native language.

Chapter 3 provided a detailed discussion of two constructs which have been found to exert some effects on reading comprehension outcomes for typical as well as poor readers, namely phonological awareness and morphological awareness. The first kind of awareness, particularly at the phoneme level, has been suggested to be a critical prerequisite for the acquisition of decoding skills in both dyslexic and nondyslexic individuals. Therefore, it has been assumed that dyslexics with poor phonological awareness skills are very likely to have difficulties with single-word reading, which in turn, might cause poor reading comprehension. As a result, reading comprehension difficulties in dyslexia are viewed as secondary, a consequence of poor word decoding. However, the relative significance of phonological awareness as a predictor of reading comprehension performance may decrease gradually during the course of development. Many dyslexics, often due to print exposure, learn to compensate their decoding deficits by developing alternative reading strategies (e.g., sight-word reading and relying on context more than their normally-reading peers) and may comprehend written texts within normal or close to normal limits. There is also evidence that reading comprehension abilities of L1 and L2 students with and without reading disabilities are affected by similar underlying constructs such as awareness of phonemes, morphological awareness, and short-term verbal memory.

With respect to the second construct, awareness of morphological structures, it has been postulated that, since English orthography is morphophonemic; that is, it represents words at a morphological as well as a phonological level, speakers of English must not only have phonological awareness but also morphological awareness in order to read and comprehend

written texts successfully in this language. Morphological awareness, defined as the explicit knowledge about the meaning and structure of a word, may contribute to reading related skills in a variety of ways. For example, specific knowledge of derivational suffixes and their pronunciations can facilitate decoding (e.g., the derivational ending *–tion* is consistently pronounced *shun*), which in turn aids reading comprehension. There is an increasing body of research which indicates that morphological awareness makes a unique contribution to students' word decoding and reading comprehension performance. The magnitude of this contribution appears to increase with age in both dyslexics and non-dyslexic students.

In a number of studies evidence has been found that morphological awareness skills in individuals with dyslexia are often much poorer than in their chronological-age peers. Regarding these morphological awareness problems in dyslexia and their effects on reading achievement, there are two contrasting views. In one of them, weakness on morphological awareness tasks is assumed to be caused by deficient phonological abilities (e.g., Fowler and Liberman, 1995). Hence, the role of morphological awareness in reading is seen as secondary to phonological abilities. This view has also been termed the "phonological" hypothesis of morphological deficit in dyslexia (Leikin and Zur Hagit, 2006). In the other, morphological awareness is seen as making a contribution to reading achievement which is independent of the well-documented contribution of phonological awareness (e.g., Nagy *et al*., 2003). Because this issue is still under discussion, we decided to conduct a study in which we could examine the relative influence of these two types of awareness on the reading comprehension performance of a group of dyslexic students.

In chapter 4, the objectives of the current study were formulated and in line with those objectives two main hypotheses were proposed. They are repeated briefly below:

Hypothesis 1: Control students (i.e. non-dyslexics) may outperform experimental students (i.e. dyslexics) on all language tasks. However, given the age of the subjects (mean age 17 years) tested in the study, it was also hypothesized that some of the students with dyslexia may have built compensatory strategies that could help them get as high scores as their typically developing peers.

Hypothesis 2: Given that the participants in the present study were high school students and that their experience with the English language was assumed to have provided them with a certain amount of knowledge about the derivational suffixes:

a) It was expected that dyslexic students' performance on the reading comprehension test would have a positive and stronger correlation with the morphological awareness tasks than with phonological awareness.
b) It was hypothesized that control students' results for the reading comprehension test would correlate positively and more strongly with both morphology tasks than with the phonology task.

Chapter 5 outlined the methodology of the study. It provided information concerning the official permissions that was obtained before commencing the experimental part of the study, and then it introduced the participants who volunteered to participate. It also described the tests and the procedure of the study.

Chapter 6 presented the results of the current study. Based on these results, it was concluded that all the variables tested in this study were able to differentiate the two groups of students at a statistically significant level ($p < .001$). The reading comprehension and the real-word tests were relatively easier for both groups. However, the pseudowords test appeared to be more challenging than the phonological test for the dyslexic group, while the phonological awareness test was more difficult than the pseudoword test for the non-dyslexic group. In short, as we saw in Table 4 in chapter 6, repeated below, our first hypothesis that control students might outperform experimental students on all language tasks was borne out by the data.

Table 4. Mean percentage of accuracy for the dyslexic and the control groups

	Reading Comprehension Test	Phonological Awareness Test	Morphological Awareness Test	
			Real-words	Pseudowords
Mean percentage for the D group	**52.69%**	**43.07%**	**63.84%**	**40.76%**
Mean percentage for the C group	**91.15%**	**78.07%**	**94.61%**	**81.53%**

Note: The initials D and C stand for the terms 'dyslexic' and 'control' respectively.

As for the correlations between reading comprehension performance and morphological awareness and phonological awareness skills, the present results suggested that reading comprehension skills were more closely correlated with morphological awareness (assessed by the real-word and the nonsense-word tests) than with phonological awareness in both the dyslexic and the control group, lending support for a stronger relationship between morphological awareness and reading comprehension than between phonological awareness and reading comprehension (Hypothesis 2). However, most of these correlations were statistically insignificant. Therefore, the analyses reported here cannot be used to generate inferences that could be applied to other populations, either dyslexic or non-dyslexic.

In the last chapter, we analyzed the results concerned with the overall performance of the dyslexic and non-dyslexic subjects and compared them with the results of similar studies. Then we discussed the interplay among morphological awareness, phonological awareness, and reading comprehension with respect to previous findings.

In keeping with previous reports, both dyslexic and non-dyslexic students found the test items requiring syllable deletion (as in *(car)pet* and *cr(e)ate*) less difficult than the items requiring phoneme deletion (as in *c(l)utter*). A possible explanation for this result was that, while the articulation of a given phoneme was dependent on its neighboring phonemes, syllables may exist independently as phonetic units and this might have caused phonemes to be relatively less easy than syllables to process.

As predicted, on both of the morphology tests, control students did much better than the dyslexic students. The low accuracy of the dyslexia group provided support for the finding that English morphology was a specifically difficult area for Norwegian dyslexics acquiring English as a second language. As for the results indicating that students seemed to recognize certain suffixes more easily than others, it was proposed that developing sensitivity to morphemes might depend on exposure to those morphemes in different contexts. It was also suggested that differing levels of exposure to these morphemes in print may have caused differences in the subjects' orthographic knowledge, which in turn may have contributed to the variability in morpheme recognition. Other factors assumed to be affecting morpheme awareness in the subjects were frequency rate and the linguistic complexities of these suffixes.

The results implying a relatively weaker association between students' written text comprehension skills and phonological processing abilities was also similar to previous studies, which have reported that the importance of phoneme awareness in reading comprehension performance of individuals (with or without a reading disorder) decreased as the importance of morphological awareness in this skill increased steadily with age.

An important finding in this study was that, even though the participants with dyslexia failed on the tasks to a greater extent than their typically achieving counterparts, both groups exhibited a somewhat similar pattern of performance in terms of the errors they made on these tests, suggesting that in general, dyslexic subjects' errors on the test items differ quantitatively rather than qualitatively from those of their typically developing peers.

8.1 Limitations and future directions

Although the work reported here has added to the extant research on the morphological awareness skills of dyslexics and the nature of the interplay among morphological awareness, phonological awareness and reading comprehension, it was subject to several limitations.

The main limitation of the study was the number of participants, which was too small to allow us to draw more general conclusions. Therefore, it needs to be replicated using much larger samples of dyslexic and non-dyslexic students. Another important limitation was that the study did not include a reading-level-matched control group. The lack of this type of control group made it very difficult to determine whether any observed differences in the results of the dyslexia group and the chronological-age-matched control group were caused by the distinctive characteristics or by the different reading levels of the subject groups (Nergård-Nilssen, 2006b). Future studies might consider including a reading-age control group as well as a chronological-age control group to provide more insight into the causes of performance differences between dyslexic and non-dyslexic populations.

It should be noted that the idea of using both types of control groups was considered at the outset of this research project. However, this study was conducted in the subjects' second language rather than in their native language. It turned out that there were no *available appropriate* test instruments to measure the English language skills of Norwegian high school

students with dyslexia. Therefore, matching our dyslexic subjects to a group of younger, typically developing Norwegian students with equivalent language and literacy skills in English was both very difficult and beyond the limits of this master's project.

The measurement of morphological awareness skills of dyslexic subjects in the current study might have been confounded by their problems with word decoding, since the morphology tasks required reading. Therefore, it might be useful to include oral tasks as well as written tests in further investigations of these skills.

In section 7.1, regarding the results indicating that students were able to recognize certain suffixes more easily than others, it has been proposed that developing sensitivity to morphemes might depend on the degree of exposure to those morphemes in different contexts. Because the analyses reported here are correlational, we are not able to verify or invalidate this assumption about a possible causal relationship between morpheme awareness and print exposure. Longitudinal studies and training studies (e.g., Arnbak and Elbro, 2000) are essential to establish the causality of this association. Results from such studies would contribute to the understanding of the nature of the morphological awareness skills of students with dyslexia. Research is also needed on effective instructional methods for teaching awareness of morphemes to these students.

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APPENDIX A: Approval Letter from NSD

Norsk samfunnsvitenskapelig datatjeneste AS
NORWEGIAN SOCIAL SCIENCE DATA SERVICES

NSD

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Marit M. Westergaard
CASTL - Center for Advanced Study in Theoretical Linguistics
Universitetet i Tromsø
9037 TROMSØ

Vår dato: 29.10.2009 Vår ref: 22830 / 2 / AH Deres dato: Deres ref:

TILRÅDING AV BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 20.10.2009. All nødvendig informasjon om prosjektet forelå i sin helhet 26.10.2009. Meldingen gjelder prosjektet:

22830	*Morphological Awareness Skills of Norwegian Adolescent Dyslexics Learning English as a Second Language*
Behandlingsansvarlig	*Universitetet i Tromsø, ved institusjonens øverste leder*
Daglig ansvarlig	*Marit M. Westergaard*
Student	*Ömür Caglar-Ryeng*

Personvernombudet har vurdert prosjektet, og finner at behandlingen av personopplysninger vil være regulert av § 7-27 i personopplysningsforskriften. Personvernombudet tilrår at prosjektet gjennomføres.

Personvernombudets tilråding forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, vedlagte prosjektvurdering - kommentarer samt personopplysningsloven/-helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.

Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, http://www.nsd.uib.no/personvern/forsk_stud/skjema.html. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, http://www.nsd.uib.no/personvern/prosjektoversikt.jsp.

Personvernombudet vil ved prosjektets avslutning, 14.06.2010, rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

Vigdis Namtvedt Kvalheim

Åsne Halskau

Kontaktperson: Åsne Halskau tlf: 55 58 89 26
Vedlegg: Prosjektvurdering
Kopi: Ömür Caglar-Ryeng, Postboks 869, 9259 TROMSØ

Avdelingskontorer / *District Offices:*
OSLO: NSD, Universitetet i Oslo, Postboks 1055 Blindern, 0316 Oslo. Tel: +47-22 85 52 11. nsd@uio.no
TRONDHEIM: NSD, Norges teknisk-naturvitenskapelige universitet, 7491 Trondheim. Tel: +47-73 59 19 07. kyrre.svarva@svt.ntnu.no
TROMSØ: NSD, SVF, Universitetet i Tromsø, 9037 Tromsø. Tel: +47-77 64 43 36. nsdmaa@sv.uit.no

APPENDIX B: Approval Letter from Troms County R.O.E.

TROMS fylkeskommune
ROMSSA fylkkasuohkan

Utdanningsetaten

Ømur C. Ryeng
Postboks 869

9259 TROMSØ

Vår ref.: 09/2509-4	**Saksbehandler:** Thorsteinn Einarsson	**Arkiv:** B30&32 SAKSARKIV	
Løpenr.: 28907/09	**Tlf. dir.innvalg:** 77 78 80 73	**Deres ref.:**	**Dato:** 04.12.2009

VEDRØRENDE SVAR FRA UTDANNINGSETATEN I TROMS FYLKESKOMMUNE PÅ SØKNAD OM Å FORETA EN UNDERSØKELSE AV VG1 ELEVER MED LESE- OG SKRIVEVANSKER

Vi viser til dit brev fra 19.11. 2009 hvor det blir presisert at søknaden til utdanningsetaten kun gjelder generell tillatelse til å ta kontakt med de aktuelle videregående skoler og søke bistand hos dem til å gjennomføre undersøkelsen. Undersøkelsen skal gjennomføres i samsvar med de beskrevne retningslinjer om personvern og hver enkelt skole har fullmakt til å bestemme om de ønsker å delta.

Med grunnlag i disse avklaringene innvilges søknaden og vi ønsker å bli orientert om de faglige konklusjoner når de foreligger.

Med vennlig hilsen

for Sedolf Slettli
Fylkesutdanningssjef

Thorsteinn Einarsson

Besøksadresse Strandveien 13
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APPENDIX C: Letter of Information (to schools)

Tromsø 11.1.2010

Til skoleadministrasjonen ved … videregående skole

Viser til telefonsamtalen med dere den .... 2010 angående en undersøkelse av VG1 elever med lese- og skrivevansker. For å gjennomføre undersøkelsen trenger jeg ca. 20 VG1 elever (10 med og 10 uten lese- og skrivevansker). Det viktigste kriteriet for utvelgelsen av elever med lese- og skrivevansker er at det må være bekreftet av en spesialist/spesialister at elevene har slike vansker. Et felles kriterium for begge gruppene av elevene er at de ikke må ha et annet morsmål enn norsk.

Undersøkelsen består av tre lingvistiske tester: en morfologisk, en fonologisk og en leseforståelsestest. Det vil ta ca. 1 time til sammen å ta disse testene.

Jeg har skrevet to typer innformasjonsskriv med samtykkeerklæring som jeg ber dere om å formidle til elevene. Det ene skal distribueres til elever med lese- og skrivevansker og det andre til elever uten slike vansker. Jeg vil presisere at det er skolen som bestemmer utvalget av elever og tar førstekontakt med dem. Til syvende og sist er det eleven selv i samråd med foresatte som avgjør om hun eller han vil delta i undersøkelsen.

Prosjektet er godkjent av Personvernombudet for forskning, Norsk Samfunnsvitenskapelige Datatjeneste A/S og av Troms fylkeskommune.

Jeg søker med dette om å få foreta nevnte undersøkelse av VG1 elever med og uten lese- og skrivevansker på deres skole.

Håper dere ser med velvilje på prosjektet. På forhånd takk for hjelpen!

Med vennlig hilsen

Ømur C. Ryeng

Postboks: 869, 9259 Tromsø
Tlf: 93262627

Vedlegg 1: Informasjonsskriv til foresatte som har barn med lese- og skrivevansker.

Vedlegg 2: Informasjonsskriv til foresatte som har barn uten lese- og skrivevansker.

Vedlegg 3: Brev fra NSD vedrørende behandling av personopplysninger.

Vedlegg 4: Kopi av e-post fra NSDs rådgiver vedrørende tilføyelser i informasjonsskrivet.

Vedlegg 5: Brev fra Troms fylkeskommune.

APPENDIX D: Letter of Information (to the parents of dyslexic students)

Forespørsel om deltakelse i prosjektet "Morphological Awareness Skills of Norwegian Adolescent Dyslexics Learning English as a Second Language"

Jeg er masterstudent ved Universitetet i Tromsø. For tiden arbeider jeg med en masteroppgave i engelsk og pedagogikk som vil bli avsluttet 14. juni 2010. Temaet for arbeidet er lese- og skrivevansker hos VG1 elever. Med dette arbeidet ønsker jeg å kartlegge elever sine morfologiske ferdigheter i engelsk (morfologi: danning, oppbygging og bøyning av ord).

Elevene blir bedt om å lese noen korte tekster og gjennomføre noen språktester som kartlegger deres ferdigheter i å gjenkjenne ulike ordendelser. Formålet med undersøkelsen er å finne ut om det er sammenheng mellom elevers leseforståelse og deres morfologiske bevissthet. Slik vil vi kunne tilby både elever med lese- og skrivevansker og elever uten lese- og skrivevansker en bedre tilpasset undervisning i faget engelsk i framtida.

Grunnen til at jeg har bedt skolen om å formidle kontakt, er at jeg trenger data fra elever med lese- og skrivevansker. Disse dataene vil bli sammenlignet med data fra elever som ikke har lese- og skrivevansker. Ved publisering vil resultatene bli presentert i anonymisert form, og ingen enkeltperson vil kunne gjenkjennes i den ferdige oppgaven. Når prosjektet avsluttes skal alt datamateriale makuleres. Prosjektet er tilrådd av Personvernombudet for forskning, NSD, og Troms fylkeskommune.

Selve gjennomføringen av prøven tar ca. 1 time og vil foregå på skolen når det passer for eleven. Undersøkelsen er frivillig og eleven kan trekke seg når som helst, uten å måtte begrunne dette nærmere. Dersom dere velger å delta vil det være til stor hjelp for oppgaven min og bidra til økt kunnskap om dette temaet. På forhånd takk for hjelpen!

Med vennlig hilsen

MA-student: Ømur C. Ryeng
Postboks: 869, 9259 Tromsø

Veileder: Prof. Marit M. Westergaard
CASTL- Universitetet i Tromsø, 9037 Tromsø

Samtykkeerklæring

□ Jeg ønsker å delta i studien.

Elevens signatur: …….

□ Jeg gir mitt samtykke i at mitt barn deltar i studien.

Foresattes signatur: ……..

APPENDIX E: Letter of Information (to the parents of non-dyslexic students)

Forespørsel om deltakelse i prosjektet "Morphological Awareness Skills of Norwegian Adolescent Dyslexics Learning English as a Second Language"

Jeg er masterstudent ved Universitetet i Tromsø. For tiden arbeider jeg med en masteroppgave i engelsk og pedagogikk som vil bli avsluttet 14. juni 2010. Temaet for arbeidet er lese- og skrivevansker hos VG1 elever. Med dette arbeidet ønsker jeg å kartlegge elever sine morfologiske ferdigheter i engelsk (morfologi: danning, oppbygging og bøyning av ord).

Elevene blir bedt om å lese noen korte tekster og gjennomføre noen språktester som kartlegger deres ferdigheter i å gjenkjenne ulike ordendelser. Formålet med undersøkelsen er å finne ut om det er sammenheng mellom elevers leseforståelse og deres morfologiske bevissthet. Slik vil vi kunne tilby både elever med lese- og skrivevansker og elever uten lese- og skrivevansker en bedre tilpasset undervisning i faget engelsk i framtida.

Grunnen til at jeg har bedt skolen om å formidle kontakt, er at jeg trenger data fra elever med normale lese- og skriveferdigheter som ikke har, eller har hatt behov for spesialundervisning. Disse dataene vil bli sammenlignet med data fra elever som har lese- og skrivevansker. Ved publisering vil resultatene bli presentert i anonymisert form, og ingen enkeltperson vil kunne gjenkjennes i den ferdige oppgaven. Når prosjektet avsluttes skal alt datamateriale makuleres. Prosjektet er tilrådd av Personvernombudet for forskning, Norsk Samfunnsvitenskapelige Datatjeneste A/S, og Troms fylkeskommune.

Selve gjennomføringen av prøven tar ca. 1 time og vil foregå på skolen når det passer for eleven. Undersøkelsen er frivillig og eleven kan trekke seg når som helst, uten å måtte begrunne dette nærmere. Dersom dere velger å delta vil det være til stor hjelp for oppgaven min og bidra til økt kunnskap om dette temaet. På forhånd takk for hjelpen!

Med vennlig hilsen

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Samtykkeerklæring

□ Jeg ønsker å delta i studien.

Elevens signatur: …….

□ Jeg gir mitt samtykke i at mitt barn deltar i studien.

Foresattes signatur: ……..

APPENDIX F: Morphological Awareness Test (Real-word version)

DERIVATIONAL SUFFIX TEST – Real words (Singson et al., 2000)

Example:

- She hoped to make a good _____.

  A. impressive
  B. impressionable
  C. impression
  D. impressively

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1. A famous doctor performed the _____.

A. operation
B. operational
C. operative
D. operationalize

2. He likes to _____ his desires.

A. gratuity
B. grateful
C. gratify
D. demonstrate

3. Watch carefully, I will _____.

A. demonstration
B. demonstrative
C. demonstrable
D. demonstrate

4. Age improved her _____.

A. personify
B. personalize
C. personality
D. personal

5. He's too old to be _____.

A. productivity
B. productive
C. production
D. produce

6. Farmers _____ their fields.

A. fertilize
B. fertilization
C. fertility
D. fertilizer

7. She works hard. She's very _____.

A. industrialization
B. industry
C. industrious
D. industrialize

8. Those two dogs are almost _____.

A. identical
B. identify
C. identification
D. identity

9. He's always going to meetings. He's an _____.

A. activist
B. active
C. activate
D. activize

10. He was blinded by the _____.

A. bright
B. brighten
C. brightly
D. brightness

APPENDIX G: Morphological Awareness Test (Pseudoword version)

DERIVATIONAL SUFFIX TEST – Nonsense words (Singson et al., 2000)

1. I could feel the _____.

A. froodly
B. froodful
C. frooden
D. froodness

2. What a completely _____ idea.

A. tribacious
B. tribicism
C. tribacize
D. tribation

3. I admire her _____.

A. sufilive
B. sufilify
C. sufflation
D. sufilize

4. Where do they _____ the money?

A. curfamic
B. curfamity
C. curfamate
D. curfamation

5. Please _____.

A. scriptial
B. scriptize
C. scriptist
D. scriptious

6. The meeting was very _____.

A. lorialize
B. lorial
C. lorialism
D. lorify

7. I just heard a _____ story.

A. dantment
B. dantive
C. danticism
D. dandify

8. Dr. Smith is a famous _____.

A. cicarist
B. cicarize
C. cicarify
D. cicarial

9. Can you _____ both sides?

A. romify
B. romity
C. romious
D. romative

10. He has too much _____.

A. brinable
B. brinicity
C. brinify
D. brinicious

APPENDIX H: Reading Comprehension Test

- **Read the text. Choose the correct answer.**

In 1886, the people of France gave The Statue of Liberty to the United States of America. The statue is 46.50 meters high, and weighs 252 tons. This is the world's largest gift.

1. What is true about the Statue of Liberty?

a) It is the heaviest statue in the world.

b) It is the largest statue in the world.

c) It is the biggest present in the world.

- **Read the text. Choose the correct answer.**

An energetic orchestra conductor stabbed himself in the hand with his own baton during a rehearsal. Despite the pain, Dave Tilling of Bridgwater, Somerset, managed to complete the piece, Land of Hope and Glory. The piece of baton that was embedded in his hand had to be removed under anaesthetic.

2. What happened to Dave Tilling?

a) He was hit by a baton.

b) He stabbed himself.

c) A conductor stabbed him.

- **Read the text. Choose the correct answer.**

Dear Mum and Dad,

I hope you are having nice weather. It is pouring with rain here, and it has been all week. Cathy and I have been sitting around and driving Sandra mad. I do not like Sandra's cooking. I can't wait for your Sunday dinner. We hope you have been enjoying your holiday and hope you will bring back a present for us! Sandra says I have to get ready for bed now. See you soon.

Lots of love from John and Cathy and Sandra.

3. What is the letter expressing?

a) Expectation

b) Anger

c) Impressions

- **Read the text. Choose the correct answer.**

The Iceman, called Otzi, is one of the world's oldest and best-preserved mummies. He died more than 5,000 years ago. Two hikers discovered the Iceman's body on the border of Italy and Austria in 1991. Ever since, scientists have debated the cause of his death. Recently, scientists working in Australia came up with a new theory. They looked at the blood on the Iceman's clothes and the wounds on his body. Using this evidence, they concluded that the Iceman died from injuries to his back and hand.

4. Which of the following statements is true about Otzi?

a) He was found 5000 years ago.

b) He is a scientist working with mummies.

c) He is an old Australian mummy.

d) He died several thousands years ago.

- **Read the text. Choose the correct answer.**

The Ant and the Dove

A little ant was very thirsty one day, so he went down to the river. He bent down, fell in the water and was swept away. Since he couldn't swim, he was soon on the point of drowning. In a tree nearby a dove was sitting. She found a leaf and dropped it into the river close to the ant. The ant climbed onto it and floated safely to the river bank, where he climbed happily ashore. Not long after that, a bird catcher came and stopped under the tree. He laid out his net there because he wanted to catch the dove. The ant saw what he was planning, so he stung the bird catcher's foot. The sting was very painful, so the bird catcher made a lot of noise and threw down the net. The dove understood what was going on and flew away.

5. Which moral sentence sums up the main point of the fable?

a) One good deed deserves another.

b) Too much greed results in nothing.

c) A treasure to one is worthless to another.

d) It is impossible to outwit time.

- **Read the text. Choose the correct answer.**

I really love to travel. If I had a lot of money, I would go to Hawaii. I've seen pictures of really big waves where people go surfing. I would like to do that. I think the white beaches and the warm ocean would be perfect for me! I'll tell my parents that I want a surfboard for my birthday. **-** Pauline

I'd like to go to Greenland. I love the snow. In a few years, I'll be old enough to cross Greenland on skis. I'd ski for days and days, and at night I would sleep in a tent. I think I would be able to endure the cold and the endless struggle. I would wear really warm clothes and pack the right sort of food. **-** Rachel

I would like to go to South America, most of all to Peru. I would love to see where the Incas lived hundreds of years ago. There are many fantastic old stone temples to explore. That would be wonderful! I guess I'll have to save up for many years, before I can do that. **-** Beth

I want to go to Dubai! I'm very interested in tall buildings and two of the tallest hotels in the world are in Dubai. They're called the Rose Tower and Burj Al Arab. They are very modern and they look just like sculptures! I have seen fantastic pictures of the buildings. I want to go up to the top floor! **–** Georgia

6. Who wants to visit a skyscraper?

a) Pauline

b) Georgia

c) Rachel

d) Beth

7. Who is planning to save money for the trip?

a) Georgia

b) Pauline

c) Beth

d) Rachel

- **Read the text. Choose the correct answer.**

The Bat, the Birds and the Beasts

Once a great conflict was about to break out between the birds and the beasts. They were quarrelling over who had the right to drink from the nearby lake. A message was sent to all the birds asking them to join the bird army. At the same time, the herds of beasts were gathering. When the two armies were ready, the bat didn't know which group to join, the birds or the beasts. The birds that passed him said:

"Come and join our army". But the bat said: "I'm a beast".

Later on, some beasts that were passing beneath him looked up and said:

"Come and fight on our side". But the bat said: "I'm a bird".

Just as the fighting was about to start, a wise old turtle advised the two groups to focus on what was important. "The lake is big. Both groups can drink from it", the turtle said.

In the end, they came to a peaceful settlement and there was no battle. Then the bat went to the birds and wanted to join in the celebration, but they all turned against him and he had to fly away. He then went to the beasts, but soon had to retreat or they would have torn him to pieces.

"Ah," said the bat, "I see now, how stupid I was. Now I have no friends".

8. Who were enemies?

a) The bat and the beasts

b) The beasts and the birds

c) The birds and the turtle

d) The turtle and the bat

9. Why did they quarrel?

a) They had gone for a long time without drinking.

a) There was very little drinking water around.

b) They had found a lake which was not polluted.

c) They wanted a place for their group to drink.

10. Why did the bat hesitate to join one of the groups?

a) He didn't like some of the birds.

b) He didn't want to join in a fight.

c) He was busy and had a lot to do.

d) He wanted to resolve the conflict.

- **Read the text. Choose the correct answer.**

Every year thousands of children from over 100 countries attend international summer camps. Of course, the language spoken at the camps is English, otherwise it would be impossible for the children to talk to one another. Each child brings with them something from their own culture.

Ghali lives with his parents in Mombasa in Kenya. At school most of the teaching is in Swahili, but English is Ghali's favourite subject. For practice, he likes to go to town and talk to tourists at the weekends. Sometimes they pay him to take them on a tour of the old town, and then he plays some African music for them. He spent his savings on a small drum and a flute to take to camp. Maybe some of the children would like to learn to play.

Aku is from a small town just outside of Wellington, the capital of New Zealand. English is Aku's first language, but her grandmother has taught her Maori as well. The Maori were the first people to settle in what is today New Zealand, and are very proud of their culture. Aku loves the traditional dances, so she packed her costume and a CD with Maori songs to take to camp. She hopes that some of the other children will want to learn some songs and dances.

Kamal is from Calcutta in India. He attends a private school where all the teaching is in English. When he is with his friends, however, he uses Hindi. They like to play football and all sorts of sports. At the weekends, Kamal visits the market with his grandfather. The last time they were there, his grandfather bought him a new game to take to camp. Kamal plans to teach the other children how to play.

11. Who could say: "It's great to go shopping with older people because they are very generous"?

a) Kamal

b) Ghali

c) Aku

12. Who could say: "I wear special clothes when I perform"?

a) Aku

b) Ghali

c) Kamal

13. Who could say: "It's great to be able to earn a little money sometimes"?

a) Ghali

b) Aku

c) Kamal

14. Who could say: “I think the others will enjoy playing these instruments”?

a) Aku

b) Kamal

c) Ghali

15. Who could say: “I’ll explain the rules to the other players”?

a) Kamal

b) Ghali

c) Aku

16. Who could say: “I bet the others have never seen a skirt like mine”?

a) Aku

b) Ghali

c) Kamal

- **Read the text. Choose the correct answer.**

The Beggar

We all make mistakes, but there is one particular blunder that has stuck in my mind, and the more I try to forget it, the better it sticks! I know of course that the authorities would like us to believe that begging is unnecessary in our welfare state, and that beggars prefer begging to real work, but personally I am not convinced. So I sometimes give them a few coins if I think they look as though they really need the money.

Anyway, one morning as I was walking to work I saw a young chap sitting on a piece of cardboard on the pavement outside a Tube station in the city centre. Just one glance at him told me he was mentally ill. He was sitting hunched up, holding a newspaper in his hands, and he was talking to his left shoulder in a way that seemed absolutely crazy. It was as if he and his shoulder were in the middle of an important conversation.

This was obviously one of the genuinely needy. I threw a pound coin in front of him, and glanced quickly to catch the expression of surprise and gratitude that was sure to follow. "Hey, you, what's that then?" the man shouted. He sounded surprised, but not very grateful. "It's for you," I said, wondering if I'd given him too much or too little. "Wait a sec., Fred," he said to the mobile phone that was stuck between his chin and left shoulder. And then he spoke to me in a voice that was becoming more and more aggressive: "What the hell do you mean, it's for me?"

Slowly it dawned on me that the man wasn't a beggar. After all, beggars don't usually conduct their business on the phone. Even the government hasn't suggested that they are so well off. Then I saw the expensive leather jacket he was wearing, and the crash helmet by his side. And parked in the street there was a motor-bike belonging to Express Deliveries. I didn't know whether to pick the coin up again or leave it and make a quick but dignified retreat. I was debating the question when the man tossed the pound at me and suggested I ought to go away, but not quite in those words. The coin bounced off my chest and rolled into the gutter. I picked it up and left him. The last words I heard were: "Sorry about that, Fred. There was a real nutcase here..."

17. The “beggar” was sitting on

a) a motorbike

b) a leather jacket

c) some cardboard

d) a newspaper

18. The man's voice expressed

a) gratitude

b) surprise

c) shock

d) interest

19. The narrator thought that the man's leather jacket looked

a) costly

b) worn

c) inexpensive

d) invaluable

20. The point of the story is

a) don't give beggars too little

b) don't be too quick to judge others

c) the welfare state creates beggars

d) be careful where you sit