Language Development in Children at-risk of Dyslexia.

A study on the oral language of children with weak reading and writing skills.

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Abstract

Twelve Norwegian 4th grade children were tested in short-term memory, word decoding skills, naming speed, L2 comprehension and vocabulary and L1 language competence (semantics and grammar). The children were all chosen on the basis of their poor reading and writing skills, though none of the participants had a diagnosed disorder. The aim was to investigate the oral language skills of the children and compare the results to that of a formally tested control group consisting of 79 Norwegian 4th graders designed to represent an ecologically valid group of children. The results showed evidence supporting language deficits such as dyslexia and SLI in the children tested. There were also seen significant differences between the groups in regard to grammar both in syntax and morphology as well in semantics to some extent. These results suggest that children with reading and writing difficulties have lower oral language skills than that of typically developing children.

Preface

Writing this thesis has been a journey from the start. I have learned so much through this process and I truly believe I have grown as a coming teacher. After 2,5 years I am finally finished with the final product, and with that, I have a few special people to thank.

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1 Introduction

In our society, reading has become highly valued since it can be viewed as the key to education. Reading in itself, is a complex cognitive process relying heavily on word recognition and comprehension (Kim & Goetz, 1995). It is not necessarily important to understand every word when reading, the key is understanding the meaning based the context (Hellekjær, 2008). In other words, to read well there needs to be a certain flow to the process. This might be simple enough for most children; however, there is a substantial minority of children who struggle vastly with the process of reading. Today, the most common learning disability in the western world is dyslexia, affecting between 3 and 10% of the population (Snowling, 2000). It is a deficit that is believed to mainly affect phonological representations and verbal short-term memory which are essential to reading. Despite being diagnosed with dyslexia, a child can achieve good competences in both reading and writing if diagnosed early. The problem is doing so. Typical symptoms of dyslexia, such as problems in spelling and reading, persists over time, in other words one has to observe children struggling over a certain time period to see whether or not the problems continue (Høien & Lundberg, 2012). Time, however, is something these children do not have. Without a sense of achievement, a child will eventually lose motivation for the task, making it very difficult to find this motivation again. This essentially means that dyslexia needs to be diagnosed as early as possible, and to do so, new aspects must be uncovered in order to find an underlying reason for the deficit.

Oral language abilities are the foundation for literacy skills (Snowling, 2006). It was therefore intriguing to examine more closely oral language in children with dyslexia to see if they differ from that of typically developing children. The problem, however, arouse when trying to find these children. Because of an earlier study by Vulchanova, Foyn, Nilsen, and Sigmundsson (2014), which was used as a basis for the current study, tested 4th grade students, the idea was to use these children as controls while testing other 4th grader with dyslexia. Finding 4th graders with dyslexia, however, turned out to be impossible in the time given this study. Two months into the process, with the most common reply from teachers and principals being *We do not have any children with dyslexia in the 4th grade*, I realized some changes to the initial study was in order. The two months also indicated that there is a need for a better way of diagnosing dyslexia; by the 4th grade a child struggling should have been tested.

The aim of this study changed from assessing dyslexic children to investigating if the oral skills of 4th grade children at risk of a learning deficit differ from that of typically developing children. The children were chosen by their teachers on the basis of their poor reading and writing skills and because the teachers believed there might be an underlying deficit. Because the study is based on observations and not on facts there is a possibility for the children to not have a learning deficit or have something other than dyslexia. This, although weakening the study, is taken into account. The final participants were 12 Norwegian 4th grade students with poor reading and writing skills. They were tested individually over the course of two days in six tests assessing short-term memory, word decoding skills, naming speed, English vocabulary, English comprehension and overall oral language status.

The following section will give an overview of typical language development in children, and look at some key differences between typically developing children and children with dyslexia and SLI. On the basis of this theory a hypothesis about the experiment is given. The subsequent sections will closely examine the execution of the study and the results before finally discussing these results in light of the theory presented.

2 Theoretical background

2.1 Memory

Memory is our ability to encode, store, retain and recall information and is, because of this, a vital part of language learning. Atkinson and Shiffrin (1968) created early on a well known model of the memory system where they distinguished between sensory memory, short-term memory (STM) and long-term memory (LTM). Sensory memory and STM serve temporary information processing while LTM serve as a final store component where we also find the mental lexicon. The mental lexicon is believed to be a storehouse of all the words a speaker knows (Chomsky, 1965) or as Jackendoff (2002) claims, the lexicon is "*the store of words in long-term memory from which the grammar constructs phases and sentences*" (Jackendoff, 2002, p. 130). Later, Baddeley and Hitch (1974) suggested also adding working memory (WM) to the model along with STM as it is thought to both store and manipulate information.

The term WM is often used interchangeably with STM, but while it is true there is overlapping between the two components, it is important to distinguish between them as studies have shown that they place different demands on the components of the memory loop (Vulchanova et al., 2014). Children with poor verbal STM have received average scores on tasks measuring WM, and children with specific reading difficulties have been seen to typically score lower on measures of WM than verbal STM (Gathercole, Tiffany, Briscoe, Thorn,& the ALSPAC Team, 2005; Gathercole, Alloway, Willis, & Adams, 2006). The WM is by many believed to be a larger component of the memory and includes the STM as well as other processing mechanisms that help make use of STM (Cowan, 2008). In other words STM stores information while WM also manipulate the information. Even though there is a distinction between the two concepts, most of the research done on STM has been connected to the WM model described by Baddeley and Hitch in 1974 (Vance & Mitchell, 2006). In this model there are three components: the central executive, the visuo-spatial sketchpad and the phonological loop. The central executive controls the attention and regulation of information flow both within the WM and between WM and LTM. The visuo-spatial sketchpad, assumed to be the area where visual and spatial information is stored for a short period of time, and the phonological loop, temporarily storing verbal information, both serve as slave systems to the central executive.

When it comes to literacy, studies have shown significant relationships between STM, reading and phonological awareness in children (Vance & Mitchell 2006). This is especially seen in children with a learning deficit who score low on both STM and phonological awareness tasks. It is also been found that STM improves with age; a child will gradually be able to remember more items up to the age of 15, which is when it is believed that the STM is at adult level (Vance & Mitchell, 2006). This improvement in STM is due to the increased capacity of the phonological loop and the increased speed and efficiency of rehearsal (an articulatory component of the loop). Studies have also found there to be a high correlation between overall language competence and STM, and that STM significantly predicts native language competence (Vulchanova et al., 2014).

2.2 Language development

All humans are born with a natural ability to learn language (Saville-Troike, 2006). According to Gass (2003) there are two main approaches to language acquisition: the nature approach and the nurture approach. The nature approach is in line with the idea that all children are born with innate knowledge about language. This idea is based on Chomsky's theory of Universal Grammar (UG) (Chomsky, 1965). UG is the belief that there are a set of innate rules that all children are born with and within this UG we find the concept of generative grammar defined by Chomsky as "*simply a system of rules that in some explicit and well-defined way assigns structural description to sentences*" (Chomsky, 1965). These grammar rules are not necessarily something we are aware of, or even can be aware of; they are simply instinctive rules which help us determine the way of our native language. The nurture, or cognitive, approach, on the other hand, assumes that the ability to acquire language is based on general learning mechanisms and cognitive processes. In other words, people with this belief do not believe that children are born with prior knowledge of language, but rather that they learn through the environment they live in and the input they receive from others; a more external approach to language learning. Despite the differences in beliefs, all children somehow seem to learn their native language without too much effort. In fact, all typically developing children exposed to their native language before the age of 6 or 7 learn it at a native level (Gleitman & Newport, 1995).

The process of language acquisition starts even before the child is born. In the last months in the womb, the fetus is able to recognize melody and the rhythm of its native language (Karmiloff & Karmiloff-Smith, 2001). The months following the child's birth, language

develops at a rapid speed. Between 12 and 20 months the infant starts communicating using single words, and from there, goes on to combine words into two-word utterances, before combining words into small sentences, a milestone often seen between 18 and 24 months (Hulme & Snowling, 2009). This language acquisition process is universal and despite varying environmental circumstances and cultures, all normal children learn their native language to a high degree of proficiency within a short time period (Gleitman & Newport, 1995). However, if a child is not exposed to the native language before the age stated above, chances are the child will never learn a language at a native level. This is due to what researchers call the critical, or sensitive, period. The term refers to a maturing period where some crucial experiences will have its peak effect on development (Newport, 2002). In other words, this is the phase where the child has most to gain from learning a language. The period is thought to last until puberty sets in, but studies have shown that average proficiency starts declining as early as ages 4 to 6, and continues declining until it hits a proficiency plateau for adult learners (Newport, 2002). There is, however, evidence to support that acquisition of vocabulary and semantic processing can occur relatively normally in late learners, meaning that the critical period does not affect all aspects of language but rather the formal properties such as phonology, morphology and syntax (Newport, 2002).

2.2.1 Aspects of language

In general there is believed to be four aspects of language: phonology, grammar, semantics and pragmatics. Phonology is the study of sound structure and refers to the system of language that uses speech sound to signal differences in meaning (Hulme & Snowling, 2009). Grammar is thought to be a system of rules that governs how units are put together to form larger units, for example combining *un-* with *happy* to get the new word *unhappy* (morphology) and combining words into coherent sentences (syntax) (Cruse, 2002). Semantics is the system of language which is concerned with meaning both at sentence level and at word level, and pragmatics is concerned with how language is used in context (Hulme & Snowling, 2009). All of these aspects tend to develop at different rates within each individual, and the different rates of development can vary greatly between individuals making the study of language development a bit tricky. Traditionally it has been assumed that the different aspects operate independently and rely on rules within their sub-system. This view however has been questioned and recent studies suggest that there are correlations between the sub-systems of language (Vulchanova et al., 2014). In the current study, the

language battery used (TOLD-I) is designed to tap overall language competence by testing semantic skills, grammar and, indirectly, phonology (Hammill & Newcomer, 2008).

Grammar competence involves two components: morphological competence, meaning the ability to structure words, and syntactic competence, meaning the ability to make well formed phrases and sentences (Vulchanova et al., 2014). There is also a third skill related to grammar competence, namely morphological awareness. This skill can be defined as "*awareness of and access to the meaning and structure of morphemes in relation to words*" (McBride-Chang, Wagner, Muse, Chow, & Shu, 2005). In other words, this is a skill where an individual is aware of different morphemes and have knowledge of how to use the morphemes in combination with words to alter meanings. A morpheme is the smallest meaningful linguistic unit that can be combined to form words (Berthiaume & Daigle, 2014), for example prefixes (e.g., dis-, in-, ir-), suffixes (e.g., -ly, -ness, -ful) and grammatical inflections (e.g., -s or –es for plural).

2.3 Learning deficits

Although most children develop language skills at a rate mentioned above there are some factors that can cause children to differ from the norm. Some of these are general to development while others are specific to language acquisition which is what we are concerned with in this study (Karmiloff & Karmiloff-Smith, 2000). In the following paragraphs two very common disorders will be introduced: developmental dyslexia and specific language impairment.

2.3.1 Developmental dyslexia

Developmental dyslexia (henceforth, dyslexia) is often diagnosed when a person of adequate intelligence and opportunity fails to acquire age-appropriate literacy skills (Bishop & Snowling, 2004). In other words, this is a disorder in which children find it very difficult to read accurately and with fluency (Hulme & Snowling, 2009). Dyslexia is believed to be of neurobiological origin, meaning it is believed to depend heavily upon genetic risk factors. There is also a debate going on whether or not IQ is connected to this disorder. According to Hulme and Snowling (2009), however, it is useful to emphasis a certain discrepancy between reading and IQ as the idea that variations in IQ are a cause of variation in the ease with which children learn to read has not been explicitly proven. Despite the problems in accurately

defining this disorder, dyslexia is believed to be the most common learning disability affecting between 3-6% of children with more boys than girls affected (Hulme & Snowling, 2009)

2.3.1.1 Dyslexia and reading

Early studies believed dyslexics to have problems in visual perception since it is not unusual for these children to rely on small sight vocabulary; for example they can read *supper* instead of *saucer* and *thirsty* instead of *twenty* (Snowling, 2000). However, more recent studies have recognized major difficulties in phonological processing in dyslexics which, in turn, has led to phonological processing being seen as one of the main deficit in these children (Bishop & Snowling, 2004) along with limitations of verbal STM (Snowling, 2006). Phonological processing is the ability to see or hear a word, break it down to sounds and then relate these sounds to letters that make up the word. This process is seen as especially essential in reading (Berthiaume & Daigle, 2014).

Reading can be categorized into three stages of word decoding: logographic, phonological and orthographic. The logographic stage is the basic level of reading development where children still have not "cracked the code" of written words. At this stage the child treats every word as a unique stimulus that is associated with different graphic patterns (Høien & Lundberg, 2012). For example, a child at this stage can read the word *camel* because he/she associates the *m* with the humps on a camel. When the child reaches about 5 years he/she has usually acquired some basic letter-sound and letter-name knowledge which starts influencing the process of learning associations between letter strings in words and their pronunciation, which brings the child into the next stage of reading, namely the phonological stage (Hulme & Snowling, 2009). At this stage the alphabetic principle is central (developing mappings between orthography and phonology), especially in languages with alphabetic systems such as English and Norwegian. To develop this principle, some theorists believe phonemic awareness to be essential. This awareness is achieved when children are able to segment words into phonemes, for example *bat* into [b] [a] [t] (Snowling, 2000). However, even though a child has entered into this phonological stage and is able to read new words, even nonwords, there is still a long way to go before the word decoding skills are fully developed. The final stage, the orthographic stage, is the most advanced form of word decoding and is where the recognition process is fully automatized. When a reader sees a word multiple times, the word is stored as an orthographic picture within the LTM causing a reader to recognize a word within ¼ of a

second of seeing it (Høien & Tønnesen, 1997). Studies have shown that this last stage is rarely achieved by dyslexics supporting the belief of a phonological deficit in these children (Høien & Tønnesen, 1997).

2.3.1.2 Speech and auditory perception deficit in dyslexics

Phonological deficits are thought to be a cause of reading difficulties, meaning that the phonological deficit pre-dates the reading difficulties. Evidence of this comes from longitudinal studies of children selected for being at risk of dyslexia because of a family history of the disorder (Hulme & Snowling, 2009). This indicates that dyslexic children face difficulties beyond the domain of the written language. Many studies have investigated speech perception deficits in children with dyslexia, but because speech is very complex and difficult to control, results have varied vastly (Hulme & Snowling, 2009). Some results indicate that children with dyslexia on average have mild difficulties on speech perception tasks (e.g. Chiappe, Chiappe, & Siegel, 2009), while others claim these difficulties are due to other deficits the children struggle with (Manis et al., 1997). In other words, researchers are torn as to whether or not dyslexic children struggle with speech perception. There has also been many studies investigating auditory perception in dyslexic children, but although some differences have been reported between children with dyslexia and typically developing children, later studies have indicated that the problems seen were actually associated with oral language difficulties and not specifically correlated with reading problems (Hulme & Snowling, 2009). Overall, most studies fail to provide support for the idea that the phonological deficit we see in dyslexic children is in any way connected to auditory processing (Hulme & Snowling, 2009).

2.3.1.3 verbal short-term memory deficit

As mentioned earlier, researchers have recognized the limitations of verbal STM in dyslexic children. Although they seem to have a normal memory span for visual information, evidence suggests that they can remember fewer words than expected for their age (Snowling, 2000). This problem is often seen in test such as the digit span, where the subject is asked to recall sequences of digits either backwards or forward, which is often used to assess the STM of an individual (Vance & Mitchell, 2006). Deficits in verbal STM cause dyslexic readers to be less efficient than normal readers when required to recruit phonetic memory codes. In other words, they have an impaired phonological coding which restricts the number of verbal items they can retain in memory, causing problems with tasks such as mental calculations (Snowling,

2000). It is also worth mentioning that dyslexic children also have difficulties retrieving verbal information from LTM (Snowling, 2000).

2.3.1.4 Morphological deficits

One of the more recent findings in the field of dyslexia is that there seems to be a clear deficit in morphological processing and awareness. Although studies have shown different results on this subject, more and more studies seem to suggest a distinct morphological deficit in dyslexic children. Studies have demonstrated that expert readers process the morphological information contained in words to access their meaning which indicates the importance of morphological awareness when reading (Berthiaume & Daigle, 2014). When assessing this concept in children with dyslexia, studies showed that there seems to be a deficit in this area. A study by Siegel (2008) evaluated 1238 sixth-grade students on their morphological awareness skills and concluded that the dyslexic students all seemed to have serious morphological deficits even greater than their phonological deficit. Another study by Berthiaume and Daigle (2014) assessed French children and their ability to analyze written words according to their morphological structure. Although they believed that there would not be too many difficulties with these analyses because of the visual and semantic characteristics of morphemes, the children seemed to struggle more than anticipated. The authors therefore believe it possible that morphological processing in reading is not as independent from other factors as first thought. They concluded that an explicit awareness of morphological structure of words is necessary to achieve success in reading comprehension. Schiff and Raveh (2006) tested adult Hebrew readers to see if they extract and represent morphemic units similarly to normal readers. They found that dyslexic readers did not show morphological priming while normal readers showed strong morphological priming. Their findings along with that of Berthiaume and Daigle and Siegel show that dyslexics' struggle with word recognition at a morphological level.

2.3.2 Special language impairment

Specific language impairment (SLI) is a diagnose given to individuals who lack behind in their oral language without any apparent reason (Bishop & Snowling, 2004), and like dyslexia, SLI is believed to be a neurobiological disorder (Hulme & Snowling, 2009). The criteria used to identify children with SLI are complex and vary greatly, making it difficult to pin-point precisely the cause and the symptoms of the disorder this, again, makes the prevalence numbers to be a bit uncertain. On the one hand there is the linguistic view where

SLI is seen as a failure to develop grammatical rules. On the other hand there is the cognitive view which sees the problem as reflecting deficits in processing and not the knowledge of rules (Hulme & Snowling, 2009). With the complexity of the disorder in mind, it is estimated that between 3-6% of the population are diagnosed with this disorder, and again, boys tend to be more affected than girls (Hulme & Snowling, 2009). It has also been evident that SLI is rarely diagnosed by itself; it is a diagnosis with high rates of comorbidity, especially with regard to dyslexia (this will be addressed later) (Hulme & Snowling, 2009). SLI is a disorder that exclusively affects language acquisition (Karmiloff & Karmiloff-Smith, 2001) and one of the most striking characteristics of the disorder is the delayed onset and the slow rate of development (Hulme & Snowling, 2009). Children with SLI produce their first word as well as word combinations later than typically developing children (Hulme & Snowling, 2009).

2.3.2.1 SLI and grammar

It has been argued that SLI can be divided into at least six subgroups where the different forms of SLI concern problems with specific aspects of language, one of which is thought to be grammatical SLI (Karmiloff & Karmiloff-Smith, 2001). Although trying to subcategorize deficits such as SLI have been frowned upon by some researchers as this form of categorization always leaves someone in the loop, there is little doubt that grammar is a problem for many children with SLI. One theory within this aspect is the Representational Deficit of Dependant Relations (RDDR) theory proposed by van der Lely and colleagues (van der Lely, 1994; van der Lely, Rosen, & McClelland, 1998) suggesting that individuals with SLI have, among other aspects, difficulties with subject-verb agreement in English, marking of pronoun case and tense marking. It is believed that children with SLI are missing the abstract grammatical principle of inflections which is necessary in determining subject-verb agreement and grammatical case assignment (Joanisse & Sidenberg, 1998). Both these aspects depends on the syntactic relationship between noun phrase and verb phrase which indicate a difficulty in using and understanding sentence elements that mark syntactic dependencies (Bishop, Bright, James, Bishop & van der Lely, 2000). Research also indicate that individuals with SLI have problems with expressing concepts such as marking of plurals and past tense linguistically through the obligatory use of morphosyntactic structures (Karmiloff & Karmiloff-Smith, 2001). This can be seen in cases where children with SLI seem to store lexical items without noticing their component part; they would make two entries for *apples* and *apple* while typically developing children only store one entry of a lexical item and then

process the item with for example a plural marker making *apple* into *apples* (Karmiloff & Karmiloff-Smith, 2001).

2.3.2.2 Speed and auditory processing in children with SLI

While some researchers believe SLI to be manifested in the failure to develop grammatical rules, others believe SLI to be connected to cognitive deficits such as limitations in speech processing and deficits in auditory processing (Hulme & Snowling, 2009). There has been considerable evidence that children with SLI have subtle impairment in speech perception. According to Joanisse and Sidenberg (1998) children with SLI perform poorly on tasks that require discriminating phonological features such as consonant voicing and place of articulation. This, along with other studies showing clear deficits in the speed of processing, suggests that SLI children learn language in a different way than typically developing children since they misperceive speech (Joanisse & Sidenberg, 1998). However, according to Hulme and Snowling (2009) the problem in trusting all these studies is that the deficit is too general.

There have also been studies suggesting deficits in auditory processing. Corriveau, Pasquini, and Goswami (2007) tested 63 children between the age of 7 and 11 (21 with SLI, 21 matched for chronological age, and 21 matched for language age) in order to explore this aspect. Their results showed that a significant number of the SLI group performed below the age-matched controls indicating that children with SLI have auditory processing difficulties. However, according to Hulme and Snowling (2009) there are issues here as well. They point out that the evidence supporting a deficit in auditory processing is at most a weak contributor to the language learning problems seen in children with SLI. This, along with the results of speech processing, suggest that researchers do not have enough evidence to support either one of the theories. It does not, however, tell us that there is not a deficit in these aspects, there just has to be more tests on the different limitations.

2.3.2.3 Phonological deficits

As mentioned earlier, phonological deficits are problems with slow and inaccurate word recognition which pre-dates reading comprehension, meaning the deficit is not only connected to reading. In later years researchers have found that this deficit, usually referring to dyslexia, can also be seen in children with SLI. In a study by Gathercole and Baddeley (1990) children with language-disorders were assessed on nonword repetition tasks and the result led them to propose that deficits in phonological storage in WM can play a central role in the language

development of children with SLI. In other words, verbal STM deficits affect morphosyntactic processing and lexical learning (Rasmus, Marshall, Rosen, & van der Lely, 2013). Other studies have also seen this deficit as a mediator between disrupted auditory processing and broader language impairment (Tallal & Piercy, 1973; Tallal, 2003).

2.3.3 SLI vs. dyslexia

As already mentioned, SLI is known for its high rate of comorbidity, and a child with SLI will often also be diagnosed with dyslexia. In recent years, many studies have been conducted looking at individuals with SLI and their problems with both auditory perception and phonological processing, as these are aspects also believed to be seen in dyslexia. The findings set fire to a wide discussion on whether the gap between dyslexia and SLI should be as wide as it is; perhaps instead of being two different disorder they are different degrees of the same disorder (Bishop & Snowling, 2004). Bishop and Snowling (2004) decided to analyze the two deficits to see whether or not they were the same. What they found was that there were indeed close behavioral similarities between the two and they could be seen as different degrees of the same deficit. However, for practical reasons it might be more helpful keeping a distinction between problems in literacy and in oral language. They also suggested that the cause of dyslexia was phonological deficits while the cause of SLI was phonological deficits along with additional deficits causing language impairment. On the other hand, other researchers such as Kamhil and Catts (1986, as cited in Rasmus et al., 2012) and Tallal (2003, as cited in Rasmus et al., 2012) believe it necessary to view the difference between the two deficits as one of degree as they believe the cause is phonological deficit but the deficit is more severe in SLI than it is in dyslexia. The third view is the belief that these two disorders are entirely distinct disorders, each with its own cause (Rasmus et al, 2012). In other words, it is very uncertain whether the two disorders are the same or not. However, what is agreed upon is the fact that these two disorders often walk hand in hand.

2.4 Hypothesis and prediction

Initially the study aimed to find differences in oral language between dyslexic children and typically developing children. However, as it was difficult to find 4th graders diagnosed with the disorder, the idea was for the teachers to handpick the children they believed to be at-risk of dyslexia because of poor reading and writing skills. As this was the initial frame for the study, it was believed that the children would score low on tasks measuring STM, naming speed and word decoding, as this is typical in dyslexic children. Also, since oral language is

the basis of written language, it was believed that there might be deficits seen in the test battery assessing semantics organization, lexical skills, grammar, and meta-linguistic grammar awareness (TOLD-I), especially with regard to the morphological comprehension subtest as studies have indicated deficits in this area.

3 Method

The aim of this study was to investigate the oral language competence and skills of children at risk of a learning deficit to see if they differ from typically developing children, and if so, in what way. 12 Norwegian 4th graders were tested individually with tests designed to assess their oral skills, their STM, their word decoding skills and their English vocabulary and comprehension. The oral language skills were assessed by the non-standardized Norwegian Test of Language Development-Intermediate (TOLD-I), derived from the standardized English TOLD-I (Hammill & Newcomer, 2008), where the children were tested in semantics organization, lexical skills, grammar, and meta-linguistic grammar awareness. STM was tested using the Forward Digit Recall test (FDR) from Working Memory Test Battery for Children (Pickering & Gathercole, 2001). English vocabulary was tested using the Peabody Picture Vocabulary Test (PPVT-4) (Dunn & Dunn, 2007), and English comprehension was tested with the English Language Comprehension Test (Vulchanova, Dahl, & Grønnesby, 2009). Word decoding skills were tested using the Wordchains test (Høien & Tønnesen, 1997), and the well-known Rapid Automatized Naming test (RAN) (Denckla & Rudel, 1976) was used to test the naming speed of the participants.

3.1 Participants

The study was conducted on 12 4th grade students whose age ranged from 9.0 to 9.9 years with a mean age of 9.5; 6 girls and 6 boys were tested. All of the children had Norwegian as their native language although one of the children was bilingual with English as the other language. The results of the bilingual were analyzed and, because the results did not vary too much from the rest of the group, the child was included. The children attended two different Norwegian primary schools, one located in Stavanger and one located in Molde; 3 children were tested in Stavanger, 9 were tested in Molde. The children were handpicked by their teachers on the basis of their poor reading and writing skills. Although the teachers had evidence to believe the children might struggle with a learning deficit, none of the children had been professionally tested for a diagnosis, one however, was in the process of being so. All participants reported to have normal hearing and normal-to-correct vision.

The scores of the participants of this study were pitted against the scores of a control group. The control group, consisting of 79 students, were children who had been tested in an earlier study by Mila Vulchanova et al. (2013) and who were part of the process of standardizing the Norwegian TOLD-I. We can therefore see this group as a representative selection of 4th

graders. The mean age of the control group was 9.8 and they ranged from 9.3 to 10.3 years. 44 girls and 40 boys participated. A few of the children had dyslexia and/or AD/HD but their results did not deviate significantly from the mean of the group so they were included in the analysis.

3.2 Procedure

The participants were tested in 6 different tests conducted over a two day period; 3 tests each day. This was done so that the children were well rested for the entirety of the experiment. Each testing period lasted approximately 45 min. TOLD-I, the FDR and the English comprehension were tested on the same day, as were the RAN, the Wordchains test and the PPVT. The tests were conducted at the participants' schools during school hours. The children were taken out of class one by one, and the tests were conducted in a separate, quiet room. All the children's parents/guardians had filled out and signed consent forms for their child's participation in the project, and all the children were clearly informed that they could quit the testing at any time. Before testing, the project was approved by The Norwegian Data Protection Authority (NSD).

3.2.1 Tests

TOLD-I

The Test of Language Development-Intermediate: Fourth Edition (TOLD-I) is a standardized test of oral language development. It is used to identify strengths and weaknesses in a person's oral language proficiency as well as to measure oral language in research studies. The test consists of 6 subtests that measure semantics, syntax, and morphology skills. The test does not measure pragmatics nor does it measure phonological abilities separately since fourth-graders are so integrated with semantics and grammatical skills that they are difficult to measure alone (Vulchanova et al, 2014). The Norwegian TOLD-I has yet to be standardized. It was adapted from English to Norwegian by the team behind the control group project in 2009. The translation was done directly whenever that was possible and changed into a more appropriate Norwegian counterpart where this was necessary.

The six sub-tests of the TOLD-I are:

- *Sentence Combining* measuring syntax competence. The experimenter read minimum two short sentences and asked the child to combine them into one complex sentence

which should be as short as possible. The testing was discontinued after three consecutive errors.

Example: Simple sentences: *Jeg liker kake*. *Jeg liker is*. (I like cake. I like ice cream) complex sentence: *Jeg liker kake og is*. (I like cake and ice cream)

- *Picture Vocabulary* measuring semantic comprehension and lexical skills. The experimenter presented the child with picture cards with six pictures and read a description of some of the pictures. The child was asked to point at a picture that best describe what the experimenter read. For each picture card, the testing was discontinued after two consecutive errors.

  Example: Description: *Logrer med halen*. (Wags its tail.) Picture: Dog
- *Word Ordering* measuring syntax competence. The experimenter read jumbled words and asked the child to make a sentence by putting the words in the correct order. The testing was discontinued after three consecutive errors.

  Example: Words: *hjem, gå, la, oss* (home, go, let, us) Sentence: *la oss gå hjem* (let us go home)
- *Relational Vocabulary* measuring semantic organization skills and vocabulary. The experimenter read words belonging to a specific category and the child was asked to name the category. The testing discontinued after three consecutive errors.

  Example: Words: *rød, blå, grønn* (red, blue, green) Category: *farger* (colors)
- *Morphological Comprehension* measuring meta-linguistic skills and the morphology aspect of grammar. The experimenter read sentences, some correct and some incorrect, and the child was asked to judge whether or not the sentence was correct. The testing was discontinued if the child missed three out of consecutive five tasks after task 11. If the child missed more than one correct sentence, 0 points was rewarded on the subtest.

  Example: Sentence: *Meg spiller ball*. (Me play ball) Answer: Wrong
- *Multiple Meanings* measuring semantic organization and vocabulary. The experimenter read a homonym word and the child was asked to find as many meanings of the word as possible. The child was asked to go through all the homonyms of the subtest.

  Example: Word: *ris* (rice) Meaning: *mat/kornsort, bank/pryl, pisk* (In English: food/grain, get higher)

Forward Digit Recall from WMTB-C

The Working Memory Test Battery for Children as a whole is used to accurately assess the working memory in 5 to 15 year olds. It consists of nine subtests. In this study only one of the subtests were used, namely the Forward Digital Recall test which is used to test short-term memory.

When testing with the FDR, the experimenter read sequences of digits and the child was asked to repeat the sequence. The test consists of eleven blocks with six sequences in each block. The first block consists of six digits, the second consists of six sequences of two digits, the third consists of six sequences of three digits and so on. The final block consists of six sequences of eleven digits. The testing discontinued after the child failed to repeat the sequences correctly in more than two whole blocks.

Peabody Picture Vocabulary Test

The Peabody Picture Vocabulary Test-4, version A, was used to test vocabulary size in English as a second language. The test consists of 19 sets with 12 English words in each set. For each word, the child was shown four pictures and then asked to point to the picture corresponding to the word. The test discontinued when the child had hit the ceiling set, meaning eight or more errors in a set. After the testing was finished, the examiner calculated a raw score for each participant.

The Wordchains test

The Wordchains test, or "*Ordkjede"* in Norwegian, is a simple screening test used for mapping a child's word decoding skills. The subjects were given a booklet containing in total 90 wordchains where each wordchain consisted of four words ranging from two to seven letters (e.g. *ordpilvedhvem*, *treoverlivse*). The child was given four minutes to go through as many wordchains as possible drawing a line between the four words of a chain (e.g. *ord|pil|ved|hvem, tre|over|liv|se*). The child was given points for each correctly marked chain.

The English Language Comprehension Test

The English Language Comprehension Test was designed by the group in charge of the control group study. It was designed as a sentence-picture matching task to test comprehension accuracy. This test was the only test requiring a computer. The child was faced with 30 different English sentences and for each sentence the screen showed four

pictures: one corresponding to the sentence, one completely wrong and two that partly corresponded to the sentence. The child was asked to listen to the sentence read by an English native speaker's female voice and click on the picture that represented what the child heard. The child was given points for each correct click.

Rapid Automatized Naming test

The Rapid Automatized Naming test (RAN) measures an individual's ability to name familiar stimuli under speeded conditions. This test can be a predictor of an individual's reading skills. The test consists of four subtests: colors, letters, numbers and objects. Each subtest includes a board presenting 50 randomized stimuli in a 10x5 matrix. Using a stopwatch, the experimenter took the time the child uses to name the items as quickly as possible. The naming time was recorded for each subtest for each subject.

3.3 Analysis

All the data collected was entered onto the SPSS version 21.0 along with the data of the control group for statistical analysis. All the subtest scores were analyzed, but the total TOLD-I score was not included as the subtest scores were thought to be more interesting.

4 Results

The data was analyzed in SPSS using IBM SPSS Statistics 21.0, and in order to compare the two groups, a repeated measures analysis of variance (ANOVA) and a multivariate analysis of variance (MANOVA) were applied. A Parson's correlation analysis was also applied to the test group's scores of the subtests of the TOLD-I to look for relationship between the factors.

What the MANOVA showed was that there was a significant difference between the test group and the control group when considered jointly on the Wordchains test, the FDR, the PPVT, the ELCT, the RAN and the six subtests of the TOLD-I, Wilk's $\lambda = .584$, $F(14,76) = 3.87$, $p = .000$, partial $\eta^2 = .42$. A separate ANOVA was conducted for each dependent variable, with each ANOVA evaluated at an alpha level of .05. Firstly we will look at the results of the Wordschains test, the RAN, the FDR, the PPVT and the ELCT before separately looking at the results of the TOLD-I.

The ANOVA showed that there was a significant difference between the test group and the control group on the Wordchains test, $F(1,89) = 5.94$, $p = .017$, partial $\eta^2 = .06$, on RAN numbers, $F(1,89) = 13.39$, $p = .000$, partial $\eta^2 = .131$, on RAN letters, $F(1,89) = 18.92$, $p = .000$, partial $\eta^2 = .18$, on RAN colors, $F(1,89) = 11.89$, $p = .001$, partial $\eta^2 = .12$, and on RAN objects, $F(1,89) = 9.24$, $p = .003$, partial $\eta^2 = .09$. There was not a significant difference between the test group and the control group on the FDR, $F(1,89) = .632$, $p = .429$, partial $\eta^2 = .01$, on the PPVT, $F(1,89) = 2.46$, $p = .120$, partial $\eta^2 = .03$, or on the ELCT, $F(1,89) = 1.85$, $p = .177$, partial $\eta^2 = .02$. The mean and standard deviation for all of the dependant variables can be seen in table 1. Looking at the FDR, the PPVT, the ELCT and the Wordchains test, the results show that the control group scored better than the test group on all tests. By looking at the numbers, it seem as though the test group scored higher than the control group on the RAN tests. However, because the RAN scores were noted in seconds, the results show the control group naming the elements of the RAN more quickly than the test group. So, overall, the control group showed better results than the test-group on all tests seen below.

Table 1
The difference between test group and control group in mean, standard deviation and number of participants on five of the six tests conducted.

	Group	Mean	Std. deviation	N
Wordchains test	Test group	15,42	7,267	12
	Control group	21,11	7,585	79
Forward Digit Recall test	Test group	28,83	3,614	12
	Control group	29,72	3,605	79
PPVT	Test group	69,33	28.388	12
	Control group	81,71	25,042	79
ELCT	Test group	23.08	6,052	12
	Control group	25,00	4,288	79
RAN				
- Numbers	Test group	35,092	9,3711	12
	Control group	28,803	4,7685	79
- Letters	Test group	34,208	8,7467	12
	Control group	27,177	4,5025	79
- Colors	Test group	56,417	12,8000	12
	Control group	45,181	10,1560	79
- Objects	Test group	59,292	12,1737	12
	Control group	49,790	10,1560	79

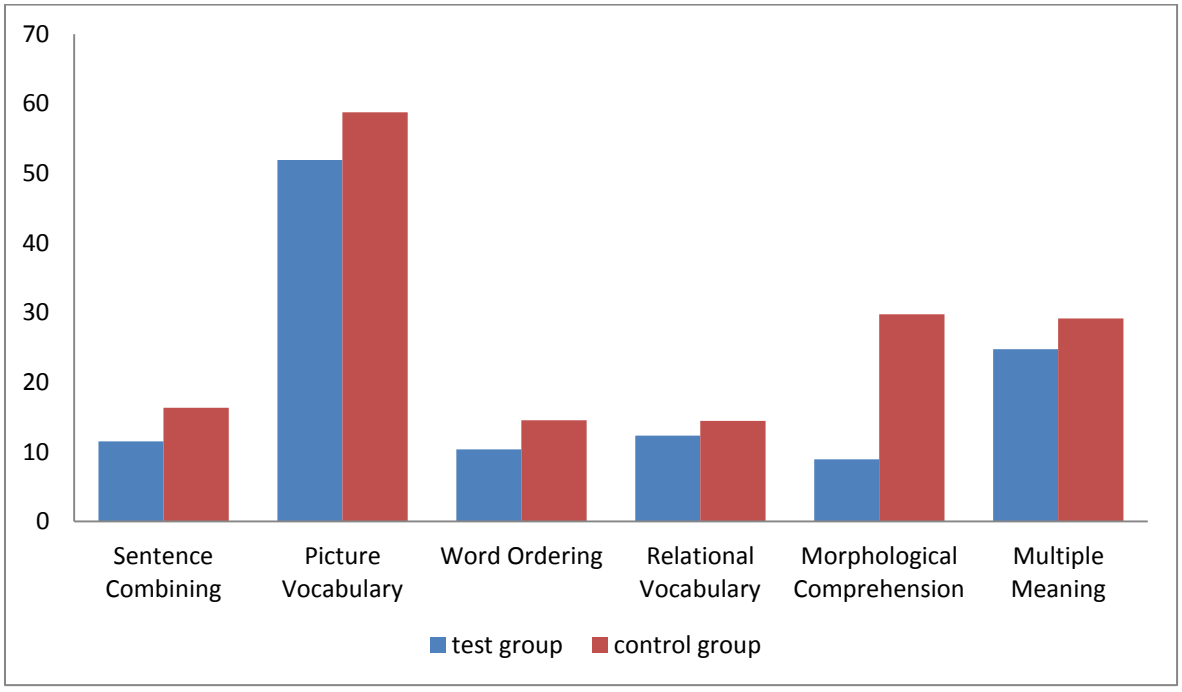
4.1 The TOLD-I

Table 2 shows the difference in mean, standard deviation and number of participants of the six subtests of the TOLD-I while table 3 illustrates the difference in mean between the test group and the control group pointing out an overall higher score to the control group. The biggest difference is seen in the results from the morphological comprehension subtest. Although, visually there is not a striking difference between the groups for the remainder of the subtests, the ANOVA tells us there are indeed significant differences in some of the other subtest. The ANOVA conducted on each dependant variable of the TOLD-I showed that there was a significant difference between the test group and the control group on TOLD-I Sentence Combination, $F(1,89) = 6.48$, $p = .017$, partial $\eta^2 = .06$, on TOLD-I Picture Vocabulary, $F(1,89) = 7.90$, $p = .006$, partial $\eta^2 = .08$, on TOLD-I Word Ordering, $F(1,89) = 9.76$, $p = .002$, partial $\eta^2 = .10$, on TOLD-I Morphological Comprehension, $F(1,89) = 35.25$, $p = .000$, partial $\eta^2 = .28$, and on TOLD-I Multiple Meaning, $F(1,89) = 8.94$, $p = .004$, partial $\eta^2 = .09$. There was not, however, a significant difference between the test group and the control group on the TOLD-I Relational Vocabulary, $F(1,89) = 1.10$, $p = .296$, partial $\eta^2 = .01$.

Table 2
The difference between test group and control group in mean, standard deviation and number of participants on six subtest of the TOLD-I.

TOLD-I subtests	Group	Mean	Std. deviation	N
Sentence combining	Test group	11,500	5,8075	12
	Control group	16,310	6,1401	79
Picture vocabulary	Test group	51,917	10,2466	12
	Control group	58,759	7,4614	79
Word ordering	Test group	10,333	3,6013	12
	Control group	14,506	4,4024	79
Relational vocabulary	Test group	12,333	6,4008	12
	Control group	14,437	6,4695	79
Morphological Comprehension	Test group	8,917	7,0512	12
	Control group	29,747	11,8034	79
Multiple meaning	Test group	24,750	3,6463	12
	Control group	29,139	4,9435	79

Table 3
An illustration of the differences in mean between test group and control group of the six subtest of the TOLD-I.



In order to have a closer look at the subtests indicating significant differences in the results, illustrations of the individual scores of each participant is seen in table 4a-e. Because of the vast difference in number of participants, the scores are shown in two different graphs: one for test group and one for control group. We can also see the results of the Pearson's correlation analysis on the six subtests in table 5.

Table 4a

The individual scores of the Sentence Combination subtest of the TOLD-I.

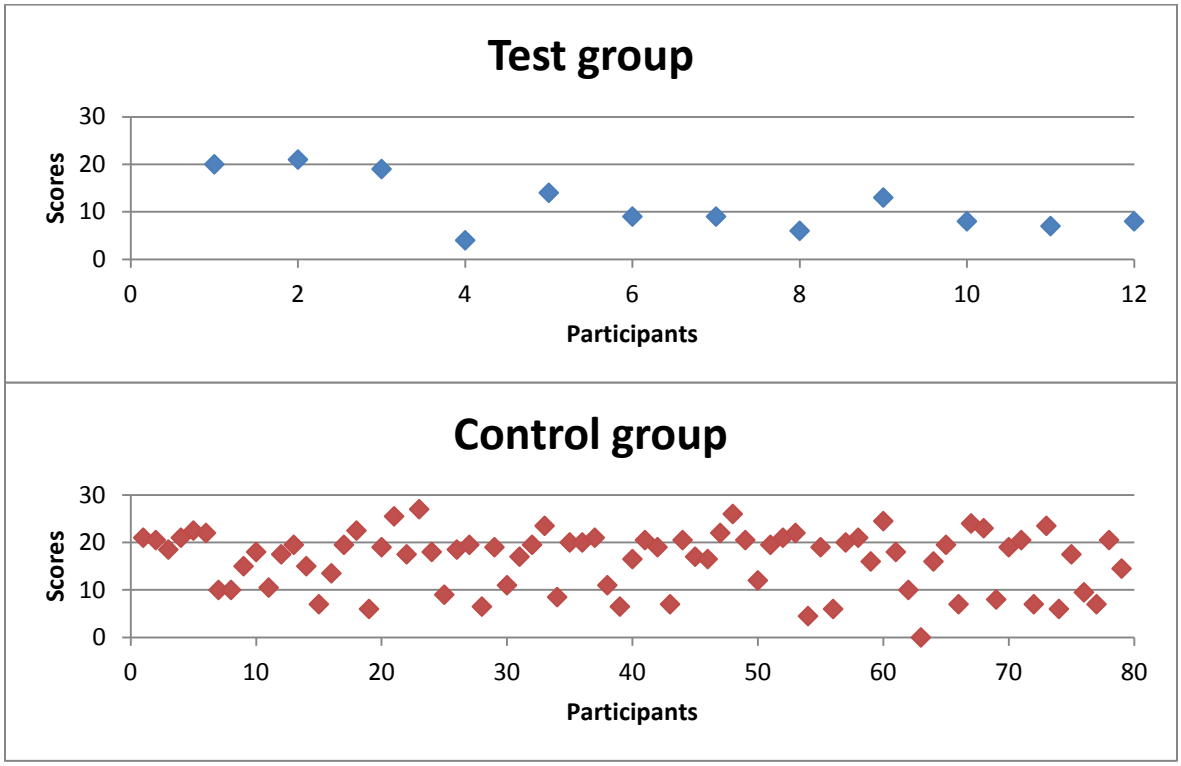


Table 4b

The individual scores of the Picture Vocabulary subtest of the TOLD-I.

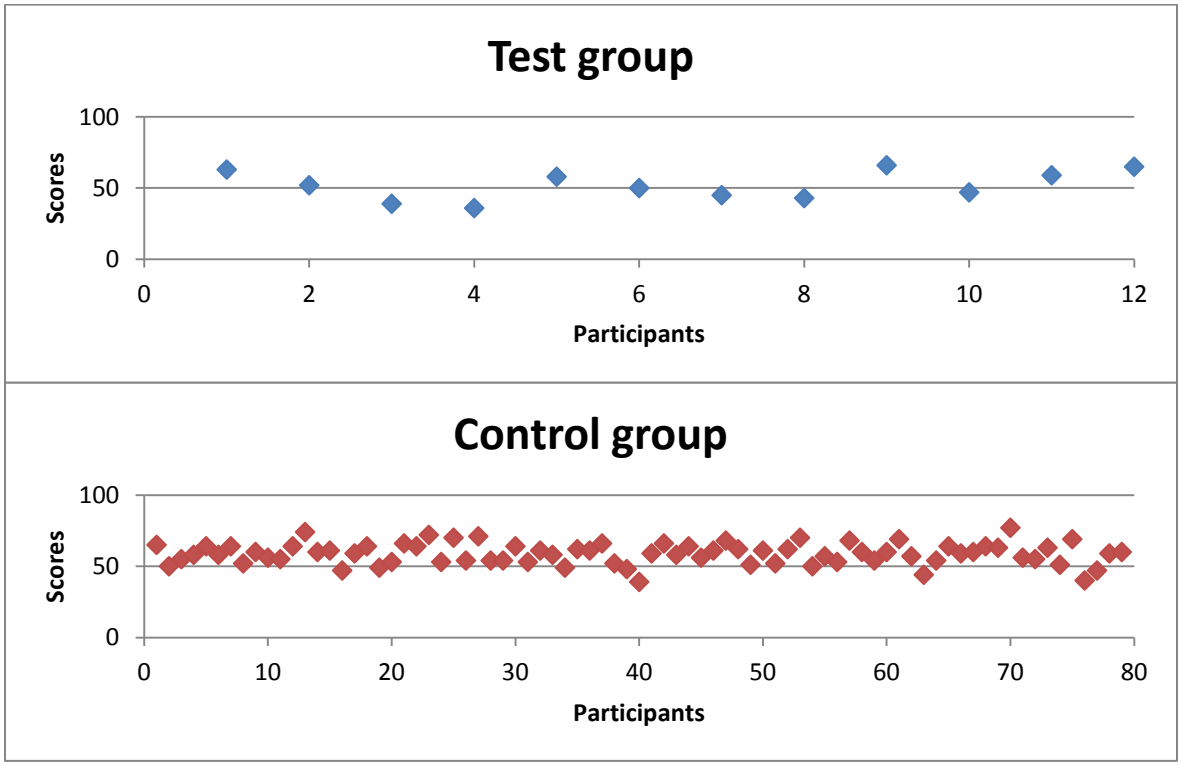


Table 4c

The individual scores of the Word Ordering subtest of the TOLD-I.

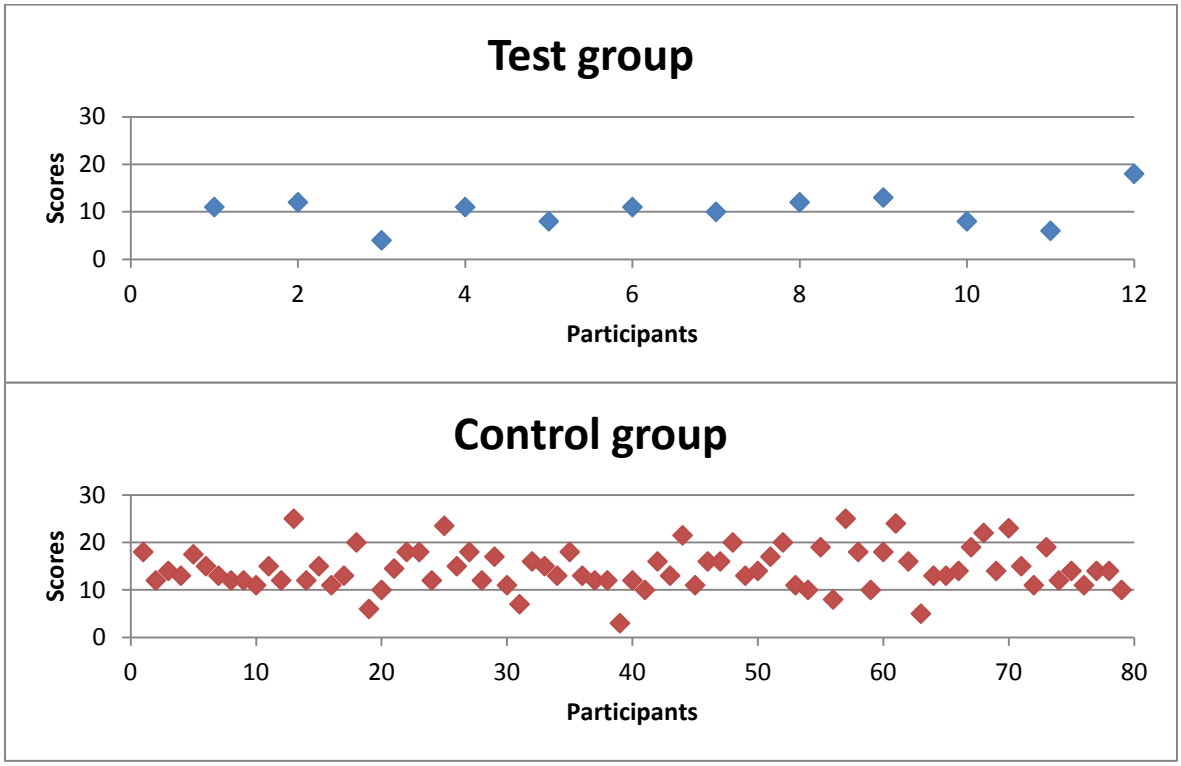


Table 4d

The individual scores of the Morphological Comprehension subtest of the TOLD-I.

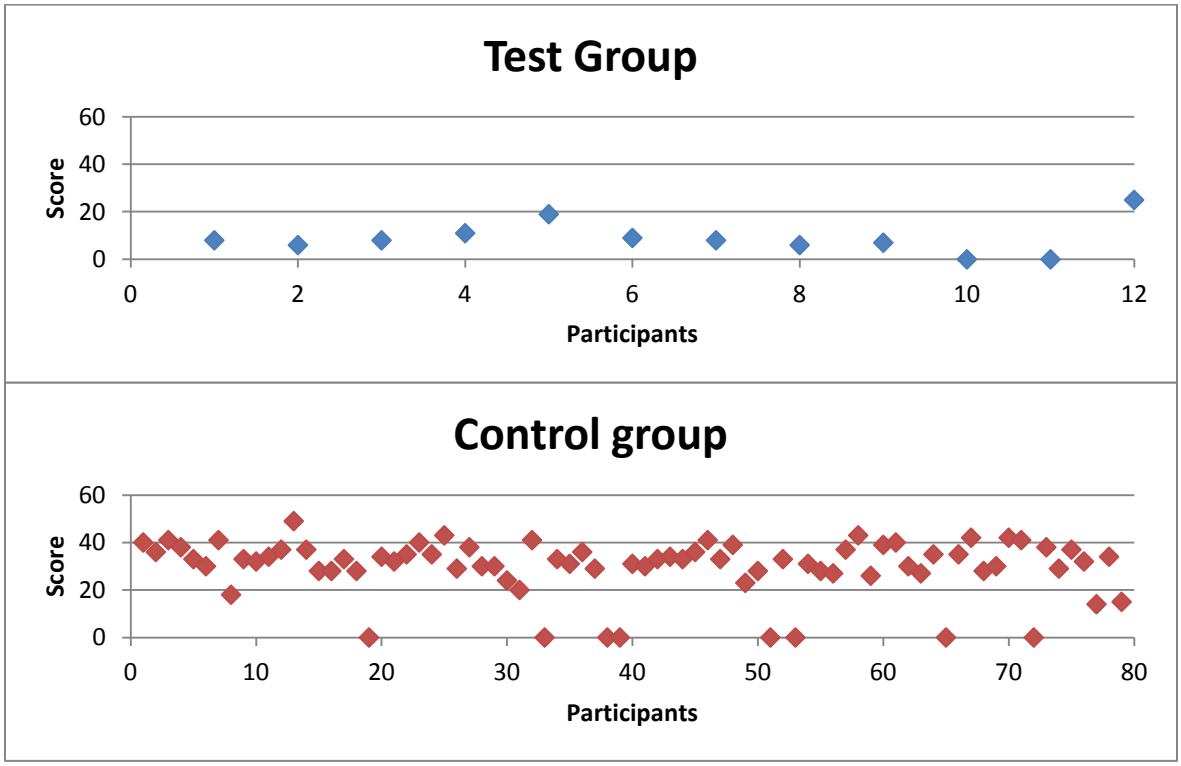


Table 4e

The individual scores of the Multiple Meaning subtest of the TOLD-I.

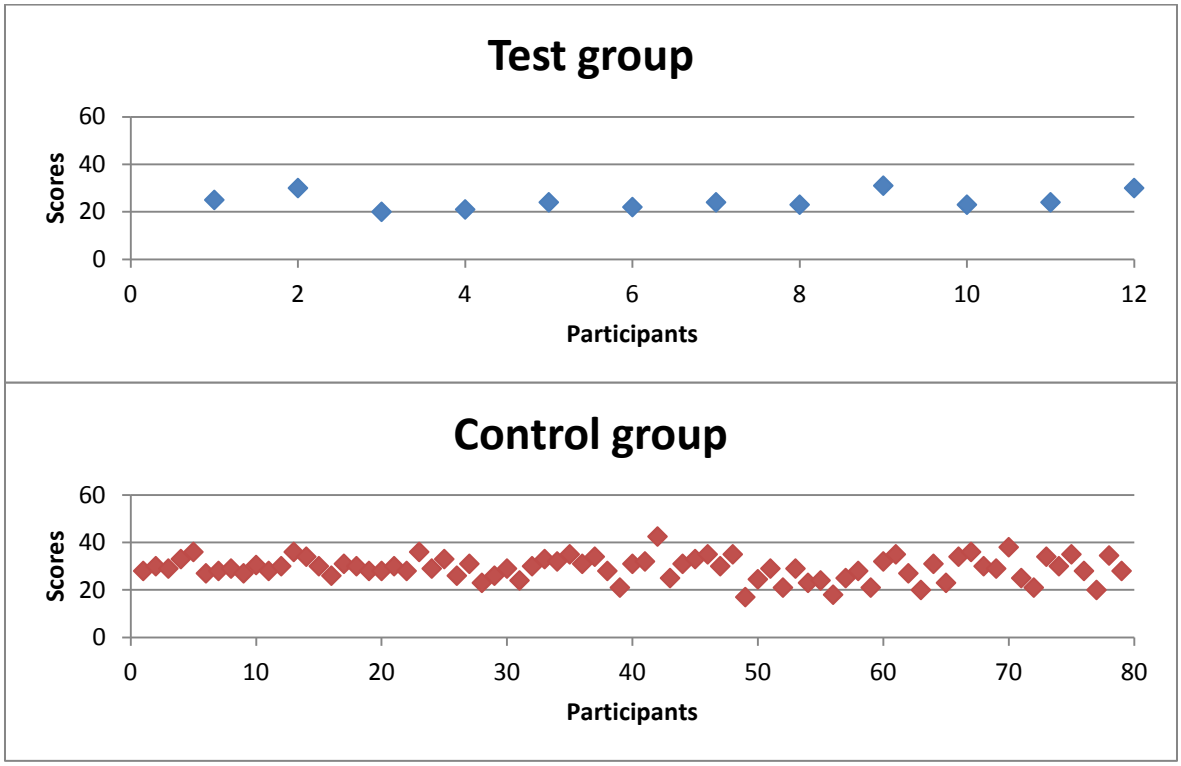


Table 5

Correlation between scores of the TOLD-I subtests: Sentence Combining (SC), Picture Vocabulary (PV), Word Ordering (WO), Relational Vocabulary (RV), Morphological Comprehension (MC) and Multiple Meaning (MM).

	SC	PV	WO	RV	MC	MM
SC	1	.251	-.183	.538	-.006	.264
PV		1	.417	.746**	.284	.744**
WO			1	.078	.542	.678*
RV				1	.214	.573
MC					1	.261
MM						1

** Correlation is significant at the 0.01 level (p < 0,01).

* Correlation is significant at the 0.05 level (p < 0.05).

5 Discussion

When analyzing the results of this study it is important to keep in mind that the children tested, although thought to be at risk of dyslexia, have not been diagnosed or even tested. The participants' teachers had chosen them because of their supposed poor reading and writing skills indicating normal symptoms of dyslexia. It is, however, possible for the children to be late developers and not have any diagnose explaining this. It is also possible for the children to have other diagnosis that cause the slow development. What the results of the current study indicate is evidence supporting a deficit but it is not therefore said that this is the case. In the following discussion a review of the evidence supporting a leaning deficit will be given before analyzing the results from the TOLD-I testing oral language skills. There will also be a short discussion concerning the results from the current study and the results from the control group study as well as a short general discussion.

5.1 The test group participants

The results of the Wordchains test were in line with the hypothesis showing a significant difference between the two groups with the test group scoring lower than the control group ($p < .025$). In four minutes the child scoring the lowest in the test group was able to "unchain" 4 wordchains while the child scoring the highest, "unchained" 28 and scored well above the mean of the control group ($M = 21{,}11$). This, again, shows a broad range in the results. In fact, although the test group scored significantly lower than the control group, three of the participants scored higher than mean of the control group indicating that, although most of the test group participants struggled with this task, some also scored within the "normal" range. Low scores on this task can be an indicator of dyslexia since deficits in word decoding is seen as the most common symptom of this deficit (Høien & Tønnesen, 1997). Since dyslexics rarely reach the orthographic stage in word decoding, the decoding will require cognitive resources causing less of these resources to be available in the process of understanding the words, this, again, might affect the reading speed of the children making it slower. Also, since orthographic readers often know which letter combination is most common, and which letters go together and which does not, it is easier for them to split the words in a wordchains. In other words, a low score on this task suggests weak orthographic word decoding skills which again is typical symptoms of dyslexia.

Dyslexics also seem to take longer to complete naming tasks such as the RAN even though the participants only need to name five basic stimuli in each set. The reason for this is rather uncertain, although, according to Snowling (2000), one explanation could be that the dyslexics' representations of the phonological forms of words are weakened, much similar to the problems with orthographic word decoding; they cannot seem to store the picture in memory which causes the phonological representation to take longer to find the word. Another explanation could be that dyslexics suffer from an impairment of a timing mechanism causing them to name highly familiar symbols quite slowly (Snowling, 2000). Although there is no significant evidence of the relationship between naming speed and reading achievement, the naming speed can be used as an indicator of the reading achievements since children with impaired reading skills often have a higher naming speed than normal readers (Muter, 2002). In this study, the results of the test group showed that the participants named all of the stimuli significantly slower than the control group ($p < .010$ for all four tests) which, again, is in line with the hypothesis. Analyzing the individual scores of the RAN and the Wordchains test shows that the children scoring within the normal range on the Wordschains test were also among the children naming the stimuli the quickest. This might suggest that these three children struggle with something other than dyslexia, however, this is just speculations. As for the rest of the participants, evidence from these two tasks supports the belief of dyslexia. However, the results of the FDR test assessing verbal STM did not show significant differences between the two groups ($p < .45$). This goes against the original hypothesis and questions the evidence supporting dyslexia since limitations in verbal STM is a major symptom of the deficit.

The TOLD-I, designed to assess oral language competence and skills in areas such as semantics and grammar, is not a common tool used for assessing dyslexia. However, the results indicated that another deficit might be a factor in these children, namely SLI. Since SLI is often diagnosed along side of dyslexia, and some even believe them to be the same deficit just of different degrees, it became evident that this deficit would also have to be taken into account in the current study. It is accepted among researchers that SLI have marked weaknesses in the area of morphosyntax (Hulme & Snowling, 2006). In fact, although there are many theories on the subject, there seems to be a universal fundamental basis that individuals with SLI have a deficit in underlying grammar. In this study, there were significant results for five out of six subtests of the TOLD-I ($p < .02$ for all five subtests), all of which the control group scored higher than the test group. Out of the five tests three were

related to grammar: Sentence Combining and Word Ordering measured syntax, while Morphological Comprehension measured meta-linguistic skills and the morphological aspect of grammar. In other words, the test group scored significantly lower on the grammatical aspects of the tests which support SLI as a deficit.

Because there are evidence supporting both dyslexia and SLI, and because it is impossible to exclude one or the other, the focus of this study will not be finding out which deficit is most likely, but rather to look at the combination of the two and how they might affects oral language.

5.2 Morphological Comprehension

The most striking results were seen in the Morphological Comprehension subtest of the TOLD-I, where the test group scored significantly lower than the control group ($p < .001$). The mean score of the control group was approximately 3.3 times higher than that of the test group ($M = 29{,}75$ vs. $M = 8{,}92$), and looking at table 4d we see that 83% of the test group children scored 11 points or lower giving them a mean of 6.3 with a standard deviation of 3.62. In the control group, with the exception of the participants scoring 0 ($K = 8$), no participant scored lower than 14 points. These results suggest a clear deficit in morphological comprehension and awareness, and the high standard deviation on this task suggest that the children tested were at quite different stages in the process of acquiring meta-linguistic skills.

What we see is that the results from this study are consistent with results from previous studies that have found dyslexics to have impaired morphological processing. According to the findings of Schiff and Raveh (2006), dyslexics have different word recognition procedures on a morphological processing level than procedures used by normal readers. This might be a reason why other studies imply that dyslexics have less morphological awareness than normal readers. There is also conclusive evidence that children struggling with SLI also have deficits in the morphological aspect of grammar. And the findings of the current study is in line with the RDDR theory suggesting deficits in morphology, especially within tense marking, marking of pronoun case and subject-verb agreement. It has also been observed that children with SLI use grammatical morphemes in obligatory context much less frequently than their age-matched peers. Also, they even use them less frequently than younger typically developing children who are on the same language level as they are (Hulme & Snowling, 2006). In short, the result on this subtest is in line with what other researchers have found

when analyzing both children with dyslexia and children with SLI. It is also evident, when analyzing the individual results of the participants, that the mistakes that were made are typical of children with learning deficits strengthening the results made in the current study.

5.2.1 Analyzing the test group participants' individual results

It is evident that the test group scored very low on this subtest. As mentioned above, out of the eleven test group participants, two scored 0 points, meaning they missed one or more than one of the correct sentences in the test; two scored much higher than the rest with 25 and 19 points (scores that were still lower than the mean of the control group); and the remaining eight scored between six and eleven points. Because of this big difference it seemed inevitable to take a closer look at the individual results of the test group to see if there were correlations between the judgments of the ten remaining participants (excluding the subjects who scored 0). The Morphological Comprehension subtest was discontinued after the participant missed three out of consecutive five tasks after task 11, meaning all participants answered the first 11 tasks while after task 11 it varied vastly how far each individual got. Because of this, in order to have the biggest remaining test group to analyze, only the first 15 tasks have been evaluated as all of the remaining ten participants answered these tasks.

5.2.1.1 Irregular verbs

When analyzing the answers of each individual the first notable finding was seen early on with the sentence *Vi stjelte to epler (We stealed two apples)*. This is a grammatically incorrect sentence since the past tense verb, being irregular, is conjugated as a regular verb. However, all participants judged this sentence to be morphologically correct. This problem seemed to be consistent as all the sentences with irregular past tense verbs conjugated as regular past tense verbs were judged morphologically correct by someone in the test group: seven of the ten judged *Mannen skrivde et brev til kongen* (*The man writed a letter to the king*) to be a morphologically correct sentence, and four of the ten judged *Han drikket melka si* (*He drinked his milk*) to be correct. These results are consistent with what would be expected in children with SLI. Studies have shown that the development of morphosyntax is much slower in children with this disorder than that of typically developing children, especially when it comes to marking verbs with tense. In an earlier study done by Rice et al. (1995) where children with SLI were tested against a group of age-matched children and a group of younger children in the use of past tense, showed that the children with SLI were less likely than the younger group to produce the correct *–ed* past tense form of verbs. These results indicate that

the mastery of a grammatical rule in children with SLI was less advanced than younger typically developing children, and that children with SLI use immature grammar for much longer than unaffected children (Hulme & Snowling, 2009). The morphological errors seen in children with SLI are much the same as those seen in younger typically developing children, indicating that the children with this deficit lags a few levels below the rest of their age-matched peers. It is also the case that children with SLI have a tendency to use morphology productively like overgeneralizing the past tense form, using the regular past tense form for all verbs (Hulme & Snowling, 2006). As the regular past tense form is easier to deal with, it is usually acquired earlier than irregular past tense form. As children with SLI often struggle with the latter, this can also be an indicator that these children are learning language in much the same way as younger typically developing children. It is also a belief that children with SLI have impairment in the making of grammatical rules, making it very difficult to learn the irregular past tense forms (Joanisse & Sidenberg, 1998).

In the study of dyslexia, morphological deficits are still a fresh research topic, but it is worth noting that this problem in irregular tense may also be a struggle for dyslexic children. According to Jackendoff (2002) semiproductive rules such as the rules for the irregular forms of the past tense in languages in for example Norwegian, must in parts be listed in the LTM and cannot be part of the free combination as the past tense of regular verbs. Since dyslexics have been reported to have reduced verbal LTM, it can be argued that this can cause children to struggle with the correct use of the past tense of irregular verbs.

5.2.1.2 Pronouns

The second observation made when analyzing the participants' scores was their struggle with judging sentences with incorrect use of pronouns. Nine out of ten judged the sentence *Han var veldig glad i hun* (*He was very fond of* she) to be morphologically correct, eight out of ten judged *Marit stolte på de* (*Marit trusted they*) to be morphologically correct, and six out of ten judged *Dem to guttene har store føtter* (*Them two boys have big* feet) to be a morphologically correct sentence. In all three sentences the incorrect use of pronouns are connected to their position in the sentence, or the case of the pronoun. Like in English, Norwegian pronouns have two cases, subject and object. Subject case is used when the pronoun is the subject of the sentence, and in Norwegian, the singular subject case pronouns are *jeg*, *du (De)*, *han*, *hun*, *den*, and *det*, while the plural subject case pronouns are *vi*, *dere (De)*, and *de*. Object case is used when the pronoun is the object of the sentence. In

Norwegian, the singular object case pronouns are *meg, deg, han/ham, henne, den,* and *det* while the plural object case pronouns are *oss, dere (Dem),* and *dem*. With this in mind, we see that the first two sentences are incorrect as they have a subject case pronoun in an object position, and the third sentence is incorrect as it has an object case pronoun in a subject position.

The problem with pronouns has been discussed to great lengths in the field of SLI research. Some believe that the production of pronouns is one of the common areas of difficulties with individuals with this deficit. It has been proposed that individuals with SLI are blind to syntactic-semantic features which can explain their problems with choosing appropriate pronouns (Hulme & Snowling, 2006). It has also been suggested that children with SLI are missing the principle of inflections which is necessary in determining grammatical case. Others, on the other hand, have not found significant evidence to support this claim (e.g. Gopnik and Crago, 1991 as cited in Hulme and Snowling, 2009). This disagreement between researchers can be an indication that more studies need to be conducted on this aspect, but the findings in the current study support the belief that there is a problem in grammatical inflection. This is also seen in subject-adjective agreement discussed below. As for the field of dyslexia, there have also been discussions about pronouns, but there are no significant results to point to. This can indicate that there is in fact something to be investigated in this area as well. However, there is not enough research done to say anything for certain.

5.2.1.3 Agreement

The final observation worth noting is the struggle with agreement between subject and adjective. Although there was only one sentence of its kind within the 15 first sentences, it is worth discussing as nine out of ten participants incorrectly judged it. The sentence was: *Skolen var misfornøyde med mobberne* (*The school was dissatisfied (no parallel in English as adjectives do not have singular or plural form) with the bullies).* Analyzing this sentence we see that *Skolen* is the subject, *var* is the verb and *misfornøyde med mobberne* is the direct object and within the direct object there is a prepositional phrase *med mobberne*. In other words, the adjective *misfornøyd* is referring to the state of mind of the school. The school is singular and, because of this, requires an adjective in singular form; there has to be agreement between the noun and the adjective. The adjective in this case, however, is in a plural form and therefore in agreement with the noun of the prepositional phrase, causing the sentence to

become ungrammatical. In short, we have an adjective describing the subject but which has been modified according to the noun in the prepositional phrase of the direct object.

As stated, there was only one sentence with agreement in the sentences analyzed in the test, making it impossible to generalize the issue as typical of the test group participants. The results, however, are in line with what would be expected of children with SLI if we believe the RDDR theory naming limitations of grammatical inflection as one issue with this deficit. In English, subject-adjective agreement does not occur and because of this there has been less research done on this aspect. However, since subject and adjective are elements of syntactic dependency in Norwegian, we can compare the aspect to the problem of subject-verb agreement in English which are also elements of syntactic dependency. In addition to this, it has also been pointed out that children with SLI struggle with understanding that morphological markings are obligatory and not optional, and that they do not comprehend when to use a plural form and when not to use it (Joanisse & Seidenberg, 1998). Although this is usually referred to when thinking about the English 3rd person singular –s, it is also possible the same problem occurs with the –e of the plural adjective in Norwegian.

It is also a possibility that WM might have something to do with the problem at hand. Children with dyslexia have been known to struggle with deficits in this area. WM is the ability to maintain various kinds of information during cognitive operations and in this sentence the children are required to maintain all the information while processing the problem at hand. In the sentence above, the adjective is linked with the first word of the sentence but is modified as though it was linked with the last word of the sentence. For a child with dyslexia, it might therefore be easier to remember the last noun more clearly than the first and because of this judge the sentence correct. However, no matter what the reason, it would have been interesting to see if this was actually an ongoing problem in these at-risk children.

5.3 Syntactic deficits

The result of the two subtests assessing syntactic skills both showed the test group scoring significantly lower than the control group (SC: $p < .02$; WO: $p < .01$) suggesting a syntactic deficit in the children. Since syntax is part of grammar, this is in line with what we would expect of children with SLI. However, analyzing the individual answers of the participants there were no striking correlations between the incorrectly answered tasks. There was no

correlation in the discontinuation of the subtest either; the Sentence Combining subtest discontinued anywhere from task 8 to task 26 while the Word Ordering subtest discontinued anywhere from 10 to one participant finishing all 32 task. Table 4a and 4c illustrate the individual scores of the two tests and it is evident that the test group participants scores were low (58% scored less than the mean on Sentence Combination and 42% scored less than the mean on Word Ordering). However, there lack of correlation makes it difficult to pinpoint a distinct reason for the low scores. What has been suggested is that there are indications that syntax is connected to STM. In their study, Vulchanova et al. (2014) saw a clear correlation between the two syntactic subtests of the TOLD-I and that of STM. In the two tests the participants were required to remember and reorganize the words they heard causing them to tap into their STM. If this indeed is the case, and the children have a learning deficit causing limitations of the STM, then these results are in line with what we would expect. Although the children in this study did not score low on the FDR test measuring STM, they still might have deficits in this area. For example, results may have been different if they were tested in both forward and backward digit recall tests.

5.4 Semantic deficit

In the subtest of the TOLD-I there were three tests designed to analyze semantics: Picture Vocabulary, Relational Vocabulary and Multiple Meaning. Deficits in semantics has been spotted both in dyslexics (e.g. Colangelo, Buchanan & Westbury, 2004) and children with SLI (Sheng & McGregor, 2010; McGregor et al., 2002), therefore the results showing significant differences in two out of the three subtests is not unexpected. However, like the results on the syntax subtests, there were no striking correlations between the incorrect answers making it difficult to generalize a typical problem. What we do know, however, is that dyslexic children often struggle with accessing their LTM and since the Multiple Meaning subtest makes the children actively access their mental lexicon to retrieve multiple sense matches to the word they hear, the fact that they scored significantly lower than the control group ($p < .005$) is not surprising. Out of the two subtests focusing on different levels of semantic organization and semantic word categories, one showed a significant difference (PV: $p < .01$) while the other did not (RV: $p < .3$). As with syntax, Vulchanova et al. (2014) found correlations between the semantic tasks of the subtest and that of STM. In semantic organization this correlation indicates a strong relationship between vocabulary development and STM. Since the children chosen were at risk of dyslexia and in theory should struggle with STM, it is in line with the deficit that they should struggle with semantics. There were no deficits seen in STM with

these children, but as mentioned, this does not mean that there is no deficit. Since the FDR was conducted by a person and not a machine, the children could have picked up on a rhythm in the listing of digits that could help them remember more easily.

5.5 Relationship between language competencies

This study was inspired by the control group study (Vulchanova et al., 2014) where, among other aspects, the internal relationships between various aspect of language development was assessed. Because of the close bond between these two studies, it was intriguing to see if there were differences to be spotted between the two groups when looking at these aspects. A Pearson's correlation analysis on only twelve children will not give a valid assessment, but it can give an indication of what the results may look like with a larger test group.

The results of the control group study showed the language sub-categories to have high correlations with each other supporting the perspective that grammar and vocabulary are inseparable (Vulchanova et al., 2014). This was not seen to the same extent in the current study. The only subtests to show correlation with each other were the Picture Vocabulary and the Relational Vocabulary, the Picture Vocabulary and the Multiple Meaning, and Multiple Meaning and the Word Ordering. The fact that Picture Vocabulary and Relational Vocabulary correlated was in itself not surprising as the two tests both probed semantic categorization and the ability to form semantic categories and label them. What is interesting is that they correlated even though the children scored significantly lower than the control group on one test and not the other. This might suggest that the correlation is due to other factors than the original study found. It is also interesting to see that so few factors correlated in the test group scores. As mentioned, one cannot rely on the Pearson's correlation analysis for this study, but it would be interesting to see if the same aspects were seen in a larger test group. If they were, it might indicate that children with dyslexia/SLI do not have the same inseparable bond between grammar and vocabulary as seen in typically developing children.

5.6 General discussion

The aim of the study was to see if there was a difference in oral language competence between children at risk of a learning deficit and typically developing children. In general the results of the current study suggest that there can in fact be spotted differences in oral language of children with a learning disability, both in respect to grammar and semantics. Because oral language skills have been suggested to be closely connected to STM, which

again is limited in children with dyslexia, this is what we would expect. However, few studies have been conducted with regard to dyslexia and oral language. SLI is known to be a deficit where the oral language is impaired, but with the evidence of Vulchanova et al. (2014) one might also find this in dyslexics. The most striking results in the current study was seen in the Morphological Comprehension subtest of the TOLD-I. However, if we are to believe the results of Vulchanova et al. (2014), this was the only subtest that did not correlate with STM. This might indicate that the results seen in this study are more closely related to SLI than dyslexia. There have, however, been seen deficit in morphological awareness in dyslexics, so it is diffidently an aspect worth investigating more closely.

It is also worth noting that there were two other tests conducted that have not been discussed, namely the ECLT and the PPVT. There were no significant differences to be spotted between the two groups and there were no distinct research suggesting there would be differences here either. Therefore, the decision was to not analyze the tests more closely. If the bilingual child was excluded from these tests, there seemed to become a significant difference in English vocabulary assessed by the PPVT; however, the results may differ because of bilingualism and not because of a potential learning deficit. The decision was therefore to keep the child in the study and not put too much focus on the English tests conducted.

5.7 Limitations of the current study

There were a few limitations in the study that need to be addressed. First of all, the test group was quite small, especially compared to the control group. Even though the participant number was big enough to give results, there is a possibility for different results if the test group had been larger. Secondly, there is the issue that none of the children have been diagnosed with a learning deficit, making the results interesting but not conclusive. In order to find conclusive evidence that this is in fact plausible results, a new study with actual diagnosed children must be conducted. The reasons why 4th graders were chosen was because of the control group. In retrospect, testing older children might have made it easier to find children with a diagnosed deficit, making the study more reliable. And lastly, when interpreting the results, the fact that the Norwegian TOLD-I has not been standardized yet, must be kept in mind.

6 Conclusion

To summarize, the study was designed to test a group of 12 Norwegian 4th graders with reading and writing deficits in 6 different tests in order to investigate the oral language of the participants. The aim was to see if the results differed from that of typically developing children. Finding differences between these participants might help find new aspects in at-risk children, which again might result in further research on the topic moving us one step closer to finding tests that can diagnose children at an earlier stage. Because earlier studies had found morphological awareness to be a struggle in children with reading and writing problems, the belief was that there would be differences seen in the Morphological Comprehension subtest of the TOLD-I.

The results of the Morphological Comprehension subtest were in line with the expectations. The children in the test group scored significantly lower on this portion of the TOLD-I, and there seemed to be a clear correlation between the wrongfully answered tasks. The results of a thorough analysis of the individual answers showed struggle in three main aspects: irregular past tense verbs, grammatical case of pronouns and subject-adjective agreement. Earlier studies suggest that these are typical problems in children with SLI which might indicate an additional deficit in the children tested. If this is the case, the results support the RDDR theory and the linguistic view of SLI suggesting a problem in acquiring grammatical rules.

The results also showed significant differences in two subtests assessing syntax and two out of three subtest assessing semantics. The results were not as striking as the results on morphology since the wrongfully answered tasks did not correlate to the same extent. However, the result in itself was interesting as recent findings suggest that these elements correlate with a person's short-term memory. Because the children struggle with reading and writing it is assumed that they struggle with verbal short-term memory, especially if they turn out to have dyslexia. If we believe the findings by Vulchanova et al. (2014), this would indicate problems in both syntax and semantics. It needs to be said that he participants in the current study did not show signs of limited verbal short-term memory as their scores on the FDR were about the same as the control group. This finings might indicate that the differences found are connected to SLI or other deficits and not dyslexia, though this is an interesting aspect for further research.

The results of this study raise a number of questions which might deserve further research. First of all it raises the question of what the results would be like if he children had been diagnosed with dyslexia as first intended in the current study. Would we find the same differences? If so, this would strengthen the results from the current study. It would also be interesting to see differences between children diagnosed with dyslexia and children diagnosed with both dyslexia and SLI to see if there are different results to be seen. If the TOLD-I can show significant differences between dyslexic children and typically developing children, then it is an easy tool for teachers to use to find support for having the child tested. It would also be interesting to see if there is a difference in the correlation between the language competences in children with dyslexia and that of typically developing children.

What is certain is that children in Norway today are tested for a learning deficit later than what would be ideal. From a teacher's point of view, it is scandalous for children to have to go to school longer than 4 years without the help they need. The first years are vital for the motivation a child needs to put a solid effort into his/her education. It is my personal belief that children should be tested if there is even just a small hint of a deficit since it is better to test too many than too few.

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