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Early lexical and grammar development in Norwegian language acquisition

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I dedicate this study to the following:

S and JK: do not grow up too fast

My beautiful nephew

My loving parents

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List of abbreviations:

CDI	Communicative Development Inventory
MCDI	MacArthur –Bates Communicative Development Inventories
MLU	Mean Length of Utterance
S	Boy in study
JK	Girl in study

Abstract:

This study was a case study of two monolingual Norwegian children S and JK. Both children are born and raised in the same area, by parents with similar academic and economic backgrounds. S was 21 months old at the onset of the study, and JK was 20 months old. Their vocabulary development was measured on the Norwegian CDI developed by Kristoffersen et al. (2012), MLU was used in order to track their grammatical development. Their language development was tracked between May 2012 and June 2012.

The aim of the study was to compare their development in vocabulary size and grammatical proficiency to determine whether a link between grammar and vocabulary, as proposed by Bates and Goodman (1997), can be found in Norwegian. Part of the aim was also to develop a Norwegian MLU protocol.

An analysis of the results indicated that a link between grammar and vocabulary size exists in Norwegian, and that using the proposed MLU protocol gives valid results. This suggests that Bates and Goodman's (1997) claimed link between grammar and vocabulary size might be a cross-linguistic phenomenon, but data from more languages need to be analysed in order to determine this.

1. Introduction

While adults learning a new language have a working knowledge of at least one language, children have to not only learn words, but also learn what those words refer to. A Norwegian adult can link the concept behind the English word *car* to the Norwegian synonym *bil*. A child cannot do this, and needs to not only learn the word *car* but also figure out what concept or entity the word refers to. In addition, a child acquiring language at a typical rate will be able to correctly use the morphology and syntax of the language he is acquiring at approximately 3 to 3.5 years of age (Bates and Goodman, 1998).

Children's ability to acquire language so fast and seemingly effortlessly fascinates linguists all over the world (Karmiloff and Karmiloff-Smith, 2002). After the middle of the last century a lot of research has been conducted in the field of language acquisition attempting to find out how children manages this incredible feat (e.g., Dale and Fenson, 1996; Bates and Goodman, 1997; Bates and Goodman, 1997; Brown, 1973; Dale and Goodman, 2005; Fenson et al., 2000; Miller, 1981). Despite this, there has been little research in the field concerning Norwegian language acquisition, though Kristoffersen et al. (2012) recently conducted a large CDI norming study. In order to do this, they developed a Norwegian CDI form, opening the door for other researchers into early Norwegian language acquisition.

1.1. Scope of the present study

The present study conducts a longitudinal study of two monolingual children acquiring their first language. S is the oldest, being 21 months at the onset of the study, while JK is a full month younger being 20 months at the onset. The children have similar backgrounds, as they grow up in the same area, they both attend kindergarten, and their parents have very similar academic backgrounds.

The aim of the study is to determine if the link between grammar and vocabulary size proposed by Bates and Goodman (1997) also exists in Norwegian. In order to do this, the

children's development in vocabulary will be tracked and compared to both the Norwegian CDI norms (Kristoffersen et al., 2012) and the American CDI norms (Dale and Fenson 1996). Their grammatical development is tracked by MLU, and an attempt is made to develop a Norwegian MLU protocol in order to do this. As there is no database with Norwegian MLU norms, the MLU results are compared to each other, and to Miller's age equivalents (1981). Miller's age equivalents (1981) are for English though, so the connection between the children's results and Miller's age equivalents (1981) are tangible at best. It does give an indication of the validity of the results, as it is improbable that the Norwegian children are years ahead or behind their English counterparts.

It is generally accepted that in order to become a grammatical being, a child first needs to acquire a suitably large vocabulary (Karmiloff and Karmiloff-Smith, 2002; Kit, 2003). It is also generally accepted that children start combining words when they are approximately 18-20 months old. Shortly after this, grammar develops at an accelerated rate (Goodman, 1995;Brown 1973). Therefore, it made sense to start compiling data for vocabulary and grammatical development when JK and S were 20 and 21 months old. The study lasted from January 2012 to June 2012.

This study is significant as it tries to determine whether the link between grammar and vocabulary, as found in English by Bates and Goodman (1997) and in Italian by Caselli, Casadio and Bates (1997), exists in Norwegian language acquisition. If the link is found, this indicates that Bates and Goodman's proposed link can be a cross-linguistic hypothesis. The study is also significant with regards to the proposed MLU protocol. If the proposed Norwegian protocol works, it would enable researchers to use the same Norwegian specific protocol to measure grammar development, and to find the Norwegian MLU norms. Even if the protocol does not work, it is still a significant step in the direction of developing a working protocol.

As this study is inspired by the findings of Bates and Goodman's article "*On the inseparability of grammar and the lexicon: evidence from acquisition, aphasia and real-time processing"* (1997), this article will be discussed in chapter 2. There will also be a brief

presentation of the results from the study conducted by Kristoffersen et al. (2012) in this chapter.

In chapter 3, the methods for collecting vocabulary and grammar data used in this study will be discussed. A detailed analyzes on how Norwegian nominal and verbal inflectional affixation differs from English is made in order to determine what adjustments need to be made to Johnson's MLU protocol (2005) in order to make it viable for measuring Norwegian MLU.

In chapters 4 and 5, the results are presented, discussed, and the study is concluded.

2. The link between grammar and vocabulary

The goal of this thesis is to determine if the link described between grammar and vocabulary, as found by Bates and Goodman (1997) for American English, also is present in the Norwegian language. This chapter is therefore primarily dedicated to presenting and discussing the evidence they put forth in their paper "*On the inseparability of grammar and the lexicon: evidence from acquisition, aphasia and real-time processing"* (Bates and Goodman, 1997). The focus will be on the evidence they gained from acquisition, as the current study is a study in the field of Norwegian language acquisition. The following data were obtained from toddlers no younger than 16 months, and no older than 30 months.

Elizabeth Bates was, and Judith Goodman still is, very well known and respected in the linguist community as experts on early language acquisition. Their combined body of work in the field of early language acquisition is impressive indeed, and Bates in particular contributed greatly to the CDI form discussed in chapter 3. Bates and Goodman therefore speak with a great deal of authority on the subject of language acquisition, and this is why their paper inspired, and was chosen to be the basis of, the present study.

The results from Kristoffersen et al. (2012) study are also of great interest. Their results will also be presented and discussed in order to see if their findings are in line with Bates and Goodman's findings.

2.1.The similarity between 20 month vocabulary and 28 month MLU

The first evidence Bates and Goodman (1997) present in their paper for the view that grammatical development and vocabulary size are linked, is the similarity between 20-month vocabulary, and the 28-month grammatical status, measured by MLU. In a longitudinal study measuring the development of both vocabulary and grammar, where the grammatical status was measured by MLU, they had some very interesting results. What they found was that the vocabulary size at 20 months was a very good predictor for the grammatical status at 28 months (Bates and Goodman, 1997). These findings indicate quite strongly that vocabulary size and grammatical development are linked somehow.

2.2.Vocabulary size and grammatical complexity

Figure 1 below shows the results of cross-sectional studies into the relationship between vocabulary size and grammatical development both for Italian toddlers, and for English toddlers (Caselli, Casadio, and Bates, 1997; as cited in Bates and Goodman, 1997). Figure 2 below show a comparison between the English results of a longitudinal study (Bates and Goodman, 1997) and the cross-sectional study from Figure 1 in the same field.

Figure 1: Sentence complexity as a function of vocabulary size for Italian and English toddlers (Caselli, Casadio, and Bates, 1997; as cited in Bates and Goodman, 1997)

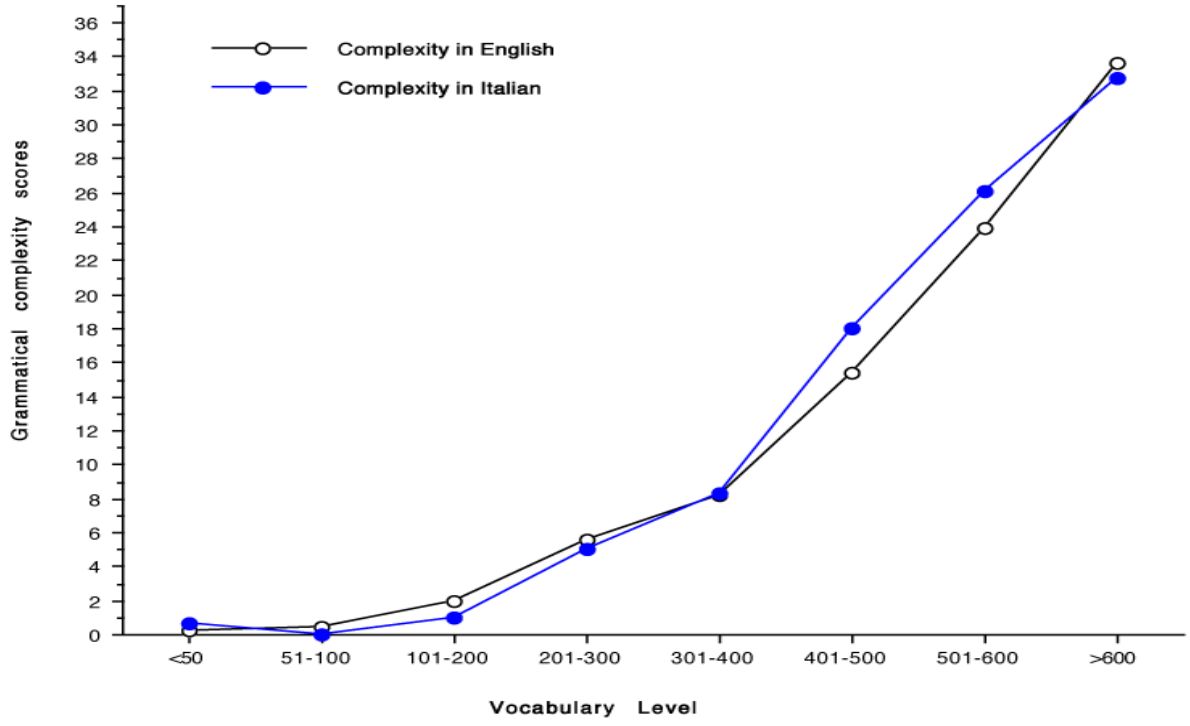
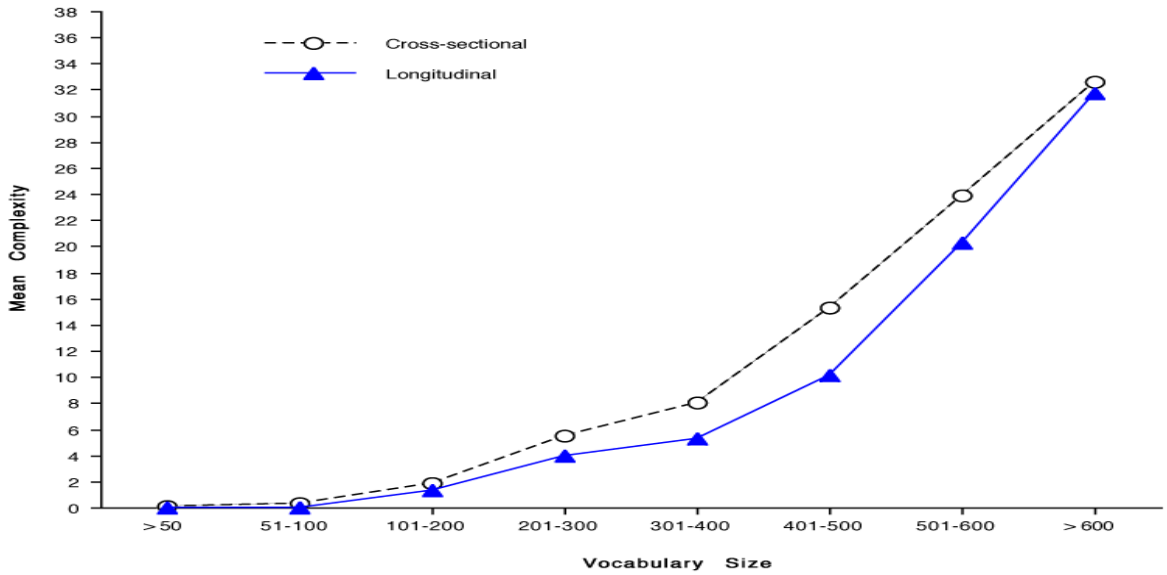


Figure 2: Grammatical complexity as a function of vocabulary level for the cross-sectional versus longitudinal samples (Bates and Goodman, 1997)



The non-linear graphs in Figure 1 are very similar, despite the fact that one graph displays data from English toddlers, and the other graph displays data form Italian toddlers. These results indicate that one can expect quite similar grammatical complexity from Italian and English toddlers at the same vocabulary level (Bates and Goodman, 1997). When the graphs are so similar, it is logical to assume that the English and Italian functions linking grammatical complexity and vocabulary size are quite similar. This is quite surprising, as Italian grammar and English grammar are quite different (Bates and Goodman, 1997). But while finding that the link exists in two different languages indicates that this is not a language specific phenomenon, data from other languages will have to be compiled in order to determine if this can be said to be a general cross-linguistic phenomenon (Bates and Goodman, 1997). It will therefore be very interesting to see if the results of the Norwegian children in this study indicate a similar relationship between grammar and vocabulary size.

The graphs in Figure 2 are also quite similar, though on average the results from the cross-sectional study are higher on the grammatical complexity axis than the results from the longitudinal study (Bates and Goodman, 1997). On the other hand, the graph representing the results from the longitudinal study shows a higher increase in grammatical

complexity from the vocabulary sizes 401-500 to <600. At vocabulary size 600, both graphs are at approximately the same grammatical complexity, though this might be a result of the finite numbers of items in the CDI.

While the graphs in figures 1 and 2 are not identical, they indicate that there is a strong link between grammatical proficiency and vocabulary size (Bates and Goodman, 1997) both in Italian and in English. A comparison between the results from a late talker and an early talker further supports this, as their grammatical complexity scores are quite similar when the late talker has a vocabulary of 272 words, and the early talker had a vocabulary of 315 words (Bates and Goodman, 1997). This also suggests that vocabulary size is more important than age for grammar development, as the late talker was older than the early talker was when they had similar complexity scores.

2.3.The Norwegian study

While Kristoffersen et al. (2012), did not present their grammatical complexity as a function of vocabulary size, they did present both vocabulary size and grammatical complexity as a function of age. Figure 3 shows vocabulary size and development as a function of age. *Antall ord* on the y-axis is the same as 'number of words' and *alder in måneder* on the x-axis is the same as 'age in months'. In figure 4, the Y-axis display *antall komplekse former* 'grammatical complexity' and the x-axis still display age in months. Both figures display the development for age groups 18-36 months. Figure 3 and 4 are from Kristoffersen et al. (2012).

Figure 3: Vocabulary as function of age, Norwegian results

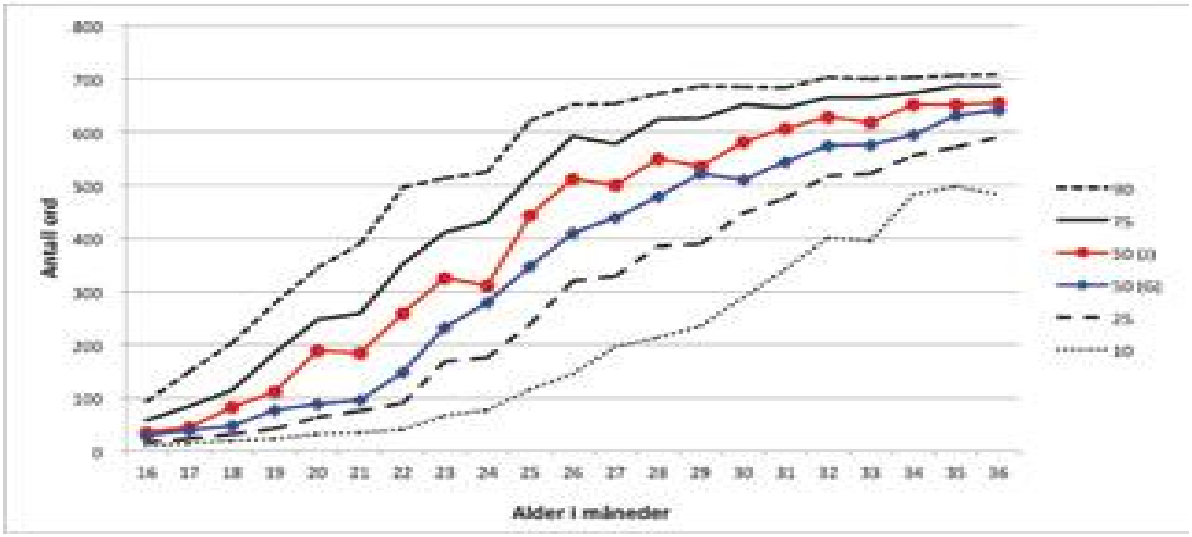
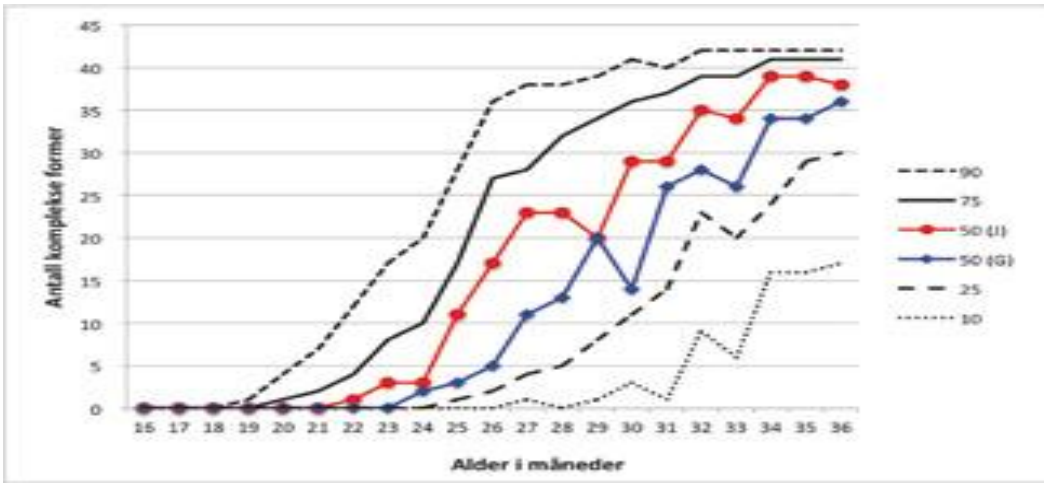


Figure 4: Grammatical complexity as function of age, Norwegian



Worth noting that the blue graph is the results for boys, and the red graph is the results for boys at the 50th percentile in both figure 3 and 4. In both figures, the results for boys are lower than the results for girls, though the graphs are relatively similar. Even Though the results for boys are lower, at 36 months they are quite similar, both for vocabulary and for complexity, to the girls' results. It is very interesting with the regards of the aim of the present study, to see that when there is a reported drop in the vocabulary between 28 and 29 months for girls, there is also reported a drop in complexity. The same is found between months 32 and 33. Between months 23 and 24 a small decrease in

vocabulary is reported to have occurred, but a decrease is not reported in the complexity graph for the same period. It is, however, reported that the complexity score for 24 months was the same as the complexity score for the preceding month.

Between the months 29-30, the vocabulary and complexity graphs for boys also go down, but at months 32-33, the vocabulary is reported to stay the same, while complexity decreases significantly. Overall, the results for boys and girls indicate that there is a link between grammar and vocabulary in Norwegian acquisition, at least for young children in the age group 16-36 months. This because boys are reported to consistently be below girls both when it come to vocabulary size and complexity, and because complexity seemingly increases or decreases at times when an increase or decrease is reported for vocabulary. The graphic representations in figure 3 and 4 do not allow us to comment on the strength of this link, however.

The data displayed in the figures were collected by using CDI forms. Caselli and Casadio (1995) developed an Italian version, and this form was used to collect the data from Italian toddlers displayed in Figure 1. Kristoffersen et al., (2012) developed the Norwegian CDI form used to collect the data displayed in figures 3 and 4. The CDI form will be used to track the vocabulary development of the Norwegian children in this thesis, and will be discussed in detail in chapter 3.

The results indicate that a link between grammar and vocabulary size exists in both English (Bates and Goodman, 1997) and Italian (Caselli, Casadio, and Bates, 1997), and to a certain degree also in Norwegian (Kristoffersen et al., 2012).

3. Methodology

3.1. Measuring language development

Being able to accurately measure the language development of JK and S is crucial in order to determine the effect, if any, the increase in vocabulary has on the grammatical development of these children. In order to determine this, it is important to track both the vocabulary development and the grammatical development of the two children. Furthermore, as the children live far from any language labs and high tech language tracking equipment, it is crucial that the measuring methods are relatively low-tech, at most requiring access to a computer. But while the measuring methods have to be low-tech, they also have to be able to yield accurate data that can be compared to the development of other children, and more specifically the findings of Bates and Goodman (1997).

Fortunately, two very good measuring methods that fit these criteria are available, and one can track developments in the vocabulary, while the other can be used to track grammatical development. The first method is known as the MacArthur-Bates Communicative Development Inventories, or CDI, and the second method is known as Mean Length of Utterance, or MLU. These measuring methods will be discussed in the first portions of this chapter.

As the children in this case study is acquiring Norwegian, and not English, a comparison between English and Norwegian syntax is made in the subchapter dedicated to MLU, in an attempt to create a Norwegian protocol for calculating MLU.

3.2.CDI

One method often used to assess vocabulary development in children is the MacArthur-Bates Communicative Development Inventories, also referred to as CDI or MCDI. This is a practical and cost effective tool that does not require the user to have access to high-tech computer software and/or high-tech equipment (Dale and Goodman, 2005).

The MacArthur-Bates Communicative Development Inventories is a parental questionnaire developed by Larry Fenson and colleagues, and it was developed from diary studies, a form of parental report used earlier (Dale and Goodman, 2005; Karmiloff and Karmiloff-Smith, 2002). Elisabeth Bates' extensive research and use of the MacArthur Communicative Development Inventories has led to the current form of the much used questionnaire, and the questionnaire used in studies these days is known as the MacArthur-Bates Communicative Development Inventories (Dale and Goodman, 2005). It is also noteworthy that Bates was among Fenson's colleagues during the development of the MCDI.

As the language development in children is quite rapid, there are actually two CDI questionnaires. The one that is relevant for the children in this study is the CDI: Words and Sentences questionnaire, as it is designed to be used when the children are between 16-30 months of age (CDI Advisory Board, 2003). This questionnaire is also known as CDI: WS.

The CDI: WS is divided into two parts. Part 1 is a vocabulary checklist, and part 2 is devoted to assessing the child's grammatical competence. As Mean Length of Utterance, known as MLU, will be used to track the grammatical development of the children in this study, the focus will be on the first part of the CDI.

Part 1 of the English CDI is a checklist of 680 words, divided into 22 semantic categories. The parents are asked to indicate which of the words the child is able to produce and/or comprehend by checking the boxes next to each word (Dale and Goodman, 2005).

The simplicity of this process is one of the strengths of the CDI, as it requires no formal training to fill out the questionnaire. As the average parent is able to fill out such a questionnaire, it means that the CDI questionnaire can be filled out in the home, by the people who are around the children the most, and still give reliable data (Karmiloff and Karmiloff-Smith, 2002). Furthermore, the ease of use and low cost of the CDI have made it possible to successfully conduct longitudinal studies with substantial samples. This has made it possible to easily conduct studies where large samples are important, such as e.g. norming studies. It has also led to the establishment of large and accessible databases, such as can

be found on the MacArthur-Bates Communicative Development Inventories webpage (http://www.sci.sdsu.edu/cdi/), and the CLEX web page (http://www.cdi-clex.org/). Investigators can therefore easily compare their findings with the findings of others, and can easily contribute to an increasing corpus of language development data (Anderson and Reilly, 2002).

As the CDI questionnaires have been adapted to different languages, investigators have been given the opportunity to easily compare vocabulary development data between languages (CDI Advisory Board, 2003; Fenson et al, 2000). The CDI has also been adapted to track language development in children acquiring American Sign Language (Anderson and Reilly, 2002), illustrating the wide usage of the CDI.

3.2.1. Development of the Norwegian CDI form

The Norwegian CDI questionnaire used in this study is the Norwegian adaptation developed and used by Kristoffersen, K.E; and Simonsen, H.G. (2012), and is approved by the CDI Advisory Board. Part 1 of the Norwegian CDI has 731 words, 51 more than the English version, spread over the same 22 semantic categories. The Norwegian CDI form is not a simple translation of the American CDI, but it is an adaptation of the original American CDI.

When developing a CDI form it is important consider cultural differences, as these differences might influence what words the child hears growing up (Hamilton, Plunkett and Schafer, 1999). When developing a CDI to use in England, Hamilton, Plunkett and Schafer (1999) had to remove some American words that simply were not in common use in England. As the differences between American English and UK English were large enough to demand the development of a British CDI form (Hamilton, Plunkett and Schafer, 1999), it stands to reason that a mere translation of the American CDI would not be suitable to track Norwegian language development (Kristoffersen et al., 2012; Hamilton, Plunkett and Schafer, 1999; Caselli and Casadio, 1995).

During the development and testing of the Norwegian CDI, parents were also asked to give suggestion to words that should be added to the CDI form. After having included a few of these words, and removed some others, the form was adapted to give comparable results to not only the American CDI, but also the Danish CDI (Kristoffersen et al., 2013). The reason behind this was that as Danish and Norwegian are very similar languages, as both are Scandinavian languages, comparing language data obtained from Danish and Norwegian is quite interesting. This means that the Norwegian CDI form used in this study gives results that can be compared both to the American CDI, and the Danish CDI. (Kristoffersen et al., 2012) As the main focus of this thesis is comparing Norwegian language acquisition to American language acquisition, the Danish CDI scores will not be discussed in this paper. One reason behind this is that MLU will be used to keep track of the grammatical development of the children, and there is no readily available data from Danish studies.

3.2.2. Validity and utility of the CDI

The validity of the CDI has been debated. One critique comes from Feldman et al. (2000). They argue that the huge individual differences in CDI values between children are indications of serious flaws in the CDI as a research tool. Furthermore, they argue that as the standard deviations often match or exceed the mean CDI values, the CDI has limited applicability (Feldman et al., 2000). Fenson et al. (2000) argues that these findings can be interpreted in another way. They argue that the high variability in CDI measures is a reflection of real variation in language development. Fenson et al. (2000) also point out that for some age goups, the standard deviation is bigger than the mean values in laboratory measures as well, meaning that this is not a CDI specific issue, but instead reflects a truth about early language development.

A study where parents first filled out the CDI, and then brought their children to an experimental setting to test if the children understood and produced the words checked on the CDI, found excellent correlations between the questionnaire measures and the results found in the experimental setting (Karmiloff and Karmiloff-Smith, 2002). These results support the claim that the CDI is a good measuring tool for early language development

(Bale and Goodman, 1997; Fenson et al., 2002; Kristoffersen et al., 2012, Heilman et al., 2005).

Other studies have also found that the CDI is a good tool for measuring early language development (e.g. Bates et al., 1994; Bauer, Golfield, and Reznick , 2002), and the reported accuracy of the CDI has led to it being widely used for both clinical and research purposes (Bates and Goodman, 1997; Fenson et al., 2000; Heilman, Weismer, Evans and Hollar, 2005). Thal et al., (1999) found that the CDI: WS could be used to assess the language skills of children above the 30 month age limit for which the CDI: WS is normed, when they examined language delayed children between the ages 39 and 49 months (Heilman et al., 2005). Heilman et al., (2005) concluded in their study of the validity of the MCDI that the MCDI was a valid method of assessing language development in toddlers.

All in all, the high validity, ease of use, low cost (Bates and Goodman, 1997; Heilman et al., 2005; Fenson et al., 2000), and the amount of comparable data, including the Norwegian norming study (Kristoffersen et al., 2012), are the main reasons why the CDI has been chosen as the measuring tool for tracking the vocabulary development of the children in this case study.

3.2.3. CDI and vocabulary

As already mentioned, the CDI forms are used to track developments in the vocabulary, by having parents fill out the forms based on what words in the checklists the child can say, and what words it understands. While the checklists are not composed of all the words a child might know, as this would make it the size of a very comprehensive dictionary, the CDI results and the complete vocabulary of a child are not necessarily the same. But the CDI results are good indicators for the development in the vocabulary, as has been seen by e.g. Fenson et al (2000), Heilman et al. (2005), and Bates and Goodman (1997). Mayor and Plunkett (2011) found that the relationship between vocabulary measured on the CDI and the complete vocabulary is so strong it is possible to calculate the complete vocabulary based on the raw MCDI scores. This means that using CDI to track vocabulary development is very viable.

3.3.Mean Length of Utterance

The method used to track the grammatical development of the children in this study is known as Mean Length of Utterance, often referred to as MLU. MLU is a very common way of tracking the grammatical development in children (Bates and Goodman, 1997), for many of the same reasons that the CDI is a common way of tracking the vocabulary development. It is a low cost, and relatively low-tech, way of calculating the grammatical complexity of a child's utterance.

MLU was first developed by Brown (1973), and he designed it to track both the length of an utterance, that is the amount of words, and the grammatical complexity of the utterance (Karmiloff and Karmiloff-Smith, 2002). Karmiloff and Karmiloff-Smith (2002) claim that simply counting the amount of words a child is able to string together does not yield a satisfactory account of the language development of said child. This because simply counting the amount of words does not take the child's grammatical development into account, an arguably important part of language acquisition (Brown, 1973; Bale and Goodman, 1997; Karmiloff and Karmiloff-Smith, 2002)

Brown (1973) therefore proposed to count morphemes instead of words, as this would also account for grammatical development. The reason for this is that in English, as well as many other languages, grammatical properties of the language are often expressed by inflectional morphemes, e.g. the possessive *–s* and past tense marker *–ed* in English. The MLU method therefore takes inflection into account, possibly giving a short, but heavily inflected utterance a similar or greater MLU value than a longer uninflected utterance. E.g. consider the phrases "Daddy eat red apple" and "Daddy eats apples". The first phrase is made up of four morphemes, only the words of the utterance themselves. The second phrase, however, is made of five morphemes, three words and two inflectional morphemes the third person *–s* in *eats*, and the plural *–s* in *apples*. (Karmiloff and Karmiloff-Smith, 2002)

This means that MLU can be used to differentiate between children that are simply stringing words together, and children that are not only combining words but also inflecting them, i.e. producing increasingly complex grammar (Karmiloff and Karmiloff-Smith, 2002).

As the main aim of this thesis is to find out whether or not there is a similar connection between lexical and grammatical development in the acquisition of Norwegian as found by Bates and Goodman (1997) in English language acquisition, it is important to be able to track the increasing use of inflectional morphemes. The MLU method also yield values that are easy to compare with each other, meaning that JK's MLU values are easy to compare with S' MLU values. Brown's rules for calculating MLU are presented in Table 3-1 below.

Table 3-1 Brown`s rules for calculating Mean Length of Utterance (Brown, 1973)

1. Begin with the second page of the transcription unless that page involves a recitation of some type. In that case, begin with the first recitation-free portion of speech. Count the first 100 utterances that satisfy the following rules.
2. Only fully transcribed utterances are used; incomplete transcriptions are not used. Portions of utterances that are entered into parentheses to indicate doubtful transcription are used.
3. Include all exact utterance repetitions (marked with a plus sign in the record). Stuttering is marked as repeated efforts at a single word; count such a word once in the most complete form that is produced. In the few instances in which a word is produced for emphasis or for similar purposes (e.g., *no, no, no)*, count each occurrence.
4. Do not count such fillers as *mm* or *oh*, but do count *no, yeah,* and *hi*.
5. All compound words (those words consisting of two or more free morphemes), proper names, and ritualized reduplications count as single words. Examples of such words include *birthday, rackety-boom, choo-choo, quackquack, night-night, pocketbook,* and *see saw*. This rule is justified because of the lack of evidence that the constituent morphemes actually function as separate morphemes for these children.
6. Count all irregular past tense forms of verbs (e.g., *got, did, went, saw)* as single morphemes. This rule is justified because of the lack of evidence that children relate these forms to present forms.
7. Count all diminutives (e.g., *doggie, mommie*) as single morphemes because children do not seem to use this suffix productively. Diminutives are the standard forms that are used by a child.
8. Count all auxiliaries (e.g., *is, have, will, can, must, would)* and all catenatives (*gonna, wanna, hafta)* as separate morphemes. Catenatives are counted as single morphemes rather than as two morphemes (e.g., *going to* or *want to*) because there exists evidence that catenatives indeed function as single morphemes for children. Count all inflections (e.g., possessive {s}, plural {s}, third-person singular {s}, regular past {d} progressive {in}) as separate morphemes.
9. The range count follows the above rules, but is always calculated for the complete transcription rather than for 100 utterances.

MLU values are also seen to be better indicators of a child's language proficiency than the chronological age of the child. What this means is that two children with the same MLU scores are predicted to produce speech of similar complexity, even if they are not of the same chronological age. This is highly relevant when studying children with delayed language development, e.g. children with SLI, where researchers often try to find out how delayed the development actually is, e.g. if the atypical developing child is at the same stage as a typical developing child that is 2 years younger (Rice, Redmond and Hoffman, 2006).

3.3.1. English vs. Norwegian syntax

As previously mentioned, Mean Length of Utterance was developed to be able to put a mean value on a series of utterances, making it easier to compare and compile language acquisition data (Karmiloff and Karmiloff-Smith, 2002). The protocol for calculating MLU is defined for English, however, and it is therefore important to adjust this protocol to fit the language being acquired. Even languages that are quite similar in many ways, such as Norwegian and English, have language specific grammatical properties. Therefore, when researching language acquisition in Norwegian children, the protocol has to be modified to account for the Norwegian language specific inflections.

It is worth mentioning that the form of Norwegian being analysed to create a Norwegian MLU protocol will be Bokmål, because the majority of Norwegians write, and to a certain degree speak, in this form, and not Nynorsk, as it is a minority form. Furthermore, the special features of the dialect spoken by the main caregivers of the children studied in this thesis will be discussed. It is also worth noting that the dialect spoken by the main caregivers is also the dialect spoken by most of the local community.

As it will be referred to often, Johnson's protocol (2005, as cited on Williamson's website 2009) will be presented before the comparison between English and Norwegian syntax, and proposed adjustments to said protocol are discussed. As can be seen, Johnson's protocol (2005) is an easy to understand compilation of Brown's (1973) rules for calculating the Mean Length of Utterance cited in Table 3-1.

Table 3-2 Johnson`s protocol for calculating MLU (Johnson, 2005)

How to count morphemes	
Method:	
1	Select 100 completely intelligible utterances (i.e. if even one word in an utterance is not understood, that utterance is excluded from the analysis. Words that are unintelligible are transcribed as x.)
2	Count the morphemes in each utterance according to the guidelines set out in the 'DO count' and 'DO NOT count' sections below.
3	Add the number of morphemes for all 100 utterances to give a total number of morphemes used.
4	Divide the total number of morphemes used obtained in step 3 above by 100 to get the mean length of utterance.
DO count:	
1	The -s plural marker (e.g. *cat-s, dog-s*). Count it even when used on irregular plurals (e.g. *mouse-s*). [Exception: plurals never occurring in the singular (e.g. *pants, clothes*) count as just one morpheme.]
2	The -ed past tense marker (*walk-ed, play-ed*). The -ed morpheme is counted even when used improperly (*go-ed, drink-ed*).
3	The -ing present participle marker (e.g. *walk-ing, count-ing*).
4	The -s 3rd person regular tense marker (e.g. *he like-s sweets, Bob walk-s fast*). [Exception: *does* counts as one morpheme.]
5	Possessive -'s marker (e.g. *mummy's hat, boy's toy*).
6	Contractions (e.g. *she's, he'll, they're, what's, she'd, we've, can't, aren't* would all count as 2 morphemes each). [Exceptions: *let's, don't* and *won't* are assumed to be understood as single units, rather than as a contraction of two words, so are just counted as one morpheme.]
DO NOT count:	
1	False starts, reformulations, or repetitions unless the repetition is for emphasis (e.g. "[then] then [he go] he went to the zoo" is counted as 6 morphemes; "No! No! No!" is counted as 3).
2	Compound words, reduplications, and proper names count as single words (e.g. *fireman, choo choo, Big Bird*).
3	Irregular past tense verbs and irregular plurals count as one morpheme (e.g. *took, went, mice, men*).
4	Diminutives (e.g. *doggie, horsie, dolly*) and catenatives (e.g. *gonna, wanna, hafta*) count as one morpheme.
5	Fillers (e.g. *um, well, oh, um hmm*).

3.3.2. **Verbs in Bokmål**

In the Norwegian and English languages, there are two groups of verbs. The Norwegian group *svake verb* is an equivalent of the English group known as regular verbs or weak verbs, while *sterke verb* is the equivalent of irregular verbs, or strong verbs, in English. In Norwegian, weak verbs are divided into two large subgroups, determined by what suffix the verb gets in the past tense. Some examples of weak verbs can be seen in Table 3-3 below (Golden,A., Mac Donald,K., and Ryen,R., 2008).

Table 3-3 Weak verbs

Weak verbs	Infinitiv/infinitive	Presens/present	Preterium/past	Perfektum partisipp/ Past participle
Group 1 -et/a	Å vask**e** 'to wash'	Vask**er**	Vask**et**/vaska	Vask**et**/vaska
Group 2 -te	Å kjør**e** 'to drive'	Kjør**er**	Kjør**te**	Kjør**t**
with vowel change	Å selg**e** 'to sell'	Selg**er**	Solg**te**	Solg**t**
-de	Å lev**e** 'to live, to be alive'	Lev**er**	Lev**de**	Lev**d**
-dde	Å bo 'to live, to reside'	Bo**r**	Bo**dde**	Bo**dd**

As can be seen, Norwegian has quite a lot of suffixes. While verbs are inflected in the past and past participle by adding a suffix in both Norwegian and English, this is also the case in the present tense in Norwegian, where the suffix *–r* or *-er* is added to the root of the verb. But it is important to remember that in speech, the simple past *–ed* is pronounced in various ways in English. The reason for why there are more different past tense suffixes in Norwegian than in English, might therefore be because the different suffixes are added to more closely represent how the suffixes are pronounced.

When calculating MLU, this does not pose a problem. According to Johnson's protocol (2005), the past marker is to be counted as a separate morpheme when calculating

MLU, and this can be easily done in Norwegian, despite the fact that the Norwegian language has more past markers. In Norwegian, the suffix *–r* or *–er* is added in the present tense. In English, verbs only take the 3rd person singular suffix *–s* in the present, therefore there is no mention of present suffixes in Johnson's protocol (2005), only the 3rd person *–s*. This has to be rectified in order to make a protocol that can be used to calculate MLU values for Norwegian utterances. The past participle is not mentioned in the "do count", nor the "do not count" lists. As verbs are inflected in past participle in both English and Norwegian, it would make sense to add the past participle suffixes to the "do count" list, as Brown (1973) claims that all inflections are to be counted as separate morphemes. In English these suffixes are *–en* and *–ed*, while in Norwegian they are *-et/a*, *-t*, *-d*, and *–dd* for weak verbs, and *–tt*, *-dd*, *-dt*, and *–t* for strong verbs, as seen below.

Strong verbs differ from weak verbs in that they do not have a suffix in the past tense. Furthermore, in the past participle they are either monosyllabic and end with *-tt*, *-dd*, *-dt*, or *–t*, or they have two syllables and end with *–et* (Golden et al. 2008). In Johnson's protocol (2005), irregular past tense verbs are to be counted as one morpheme, and this also makes sense when considering the Norwegian strong verbs, as they are not inflected by adding morphemes in the past tense. Strong verbs are inflected in the present in the same way as the weak verbs. This means that there is no need to make any adjustments to the MLU to account for any differences between Norwegian and English strong verbs, as long as the proposed adjustments to the protocol cited in table 3-2 of adding the present and past participle suffixes to the "do count" list are made. Table 3-4 on the following page (Golden et al. 2008) shows some common strong verb inflectional paradigms.

Table 3-4 Strong verbs

Infinitive	Present	Past	Past participle
Drikk**e** 'to drink'	Drikk**er**	Drakk	Drukk**et**
Skriv**e** 'to write'	Skriv**er**	Skrev/skreiv	Skrev**et**
Bli 'to become, to get'	Bli**r**	Ble/blei	Bli**tt**
Gni 'to rub'	Gni**r**	Gned/gnei	Gni**dd**
Be 'to pray'	Be**r**	Ba/bad	Be**dt**
Heng**e** 'to hang'	Heng**er**	Hang	Hengt

It is worth noting that when the stem of the verb ends with a consonant the infinitive suffix *-e* is added as with e.g *kjøre* 'to drive', but when the stem ends with a vowel the suffix is not added e.g *bo* 'to live, to reside'. This rule applies to both strong and weak verbs. This differs from how infinitives are formed in English, which explains why there is no mention of an infinitive suffix in Johnson's protocol. To adapt the protocol in order to calculate Norwegian MLU, it makes sense to add this suffix to the "do count" list, as it functions as an inflectional morpheme.

3.3.3. Auxiliary Verbs

In the following table, adapted from Goldman et al. (2008), the most common auxiliaries are presented.

Table 3-5 Auxiliary verbs

Infinitive	Present	Past	Present perfect
Skulle 'should'	Skal	skulle	Ha**r** skull**et**
Ville 'would'	Vil	Ville	Ha**r** vill**et**
Kunne 'could'	Kan	Kunne	Ha**r** kunn**et**
Måtte 'need'	Må	Måtte	Ha**r** mått**et**
Burde 'ought to'	Bør	Burde	(ha**r** burd**et**)
Få 'get, be allowed'	Få**r**	Fikk	Ha**r** få**tt**
Ha 'to have'	Ha**r**	Ha**dde**	Ha**r** ha**tt**
Bli 'get, used to form get passives, stay'	Bli**r**	Blei	Ha**r** bli**tt**
Være 'to be'	Er	Var	Ha**r** vær**t**

As with some English verbs, some Norwegian verbs can be used as both auxiliary verbs and main verbs. All of the auxiliaries can be found without a main verb in a sentence, e.g "*jeg **vil** , men jeg **kan** ikke*", "*I **would**, but I **can't***" (Golden et al. 2008). In these cases the auxiliaries are not main verbs, but the main verb is implied. Therefore it has to be possible to know from the context such a sentence occurs in to know what the main verb is. In Norwegian, it is acceptable to write or say "*Kommer du?*" followed by "*Jeg vil [komme], men jeg kan ikke*". The latter phrase answers the first phrase. An English translation could be "*Are you coming?*" "*I would [come], but I can't*".

Some verbs, however, can be used as either main verbs or auxiliary verbs in Norwegian and English. In Norwegian these verbs are *få* 'to get, to receive', *ha* 'to have', *bli* 'to become, to get', and *være* 'to be'. These verbs are inflected according to either the pattern for strong verbs, or the pattern for weak verbs, depending on what subgroup they belong to. In subchapter 3.3.2, *få* and *bli* are strong verbs, and *ha* is a weak verb. In the

present tense, they should therefore be given the MLU value two, as they are inflected with the present suffix *-r*. *Være* follows the strong verb pattern, but is a special case, as it is *er* in the present tense. The *–r* in *er* is not an inflectional suffix, and *er* should therefore be given the MLU value one. As table 3.5 shows, the other auxiliaries are not inflected by suffixes in the present tense, thus also getting the MLU value one. Of all the auxiliaries, only *ha* is inflected by a suffix in the past tense, as it is a weak verb. There might be some confusion regarding *måtte* 'ought to' as *–te* is a past tense suffix for some weak verbs. But in the case of *måtte* the *–te* is not a suffix, it is simply how the word is spelled.

The present perfect is created by the present form of *ha* 'to have', *har,* followed by the past participle form of the verb or auxiliary verb. The auxiliaries above all either take the past participle suffix *–t* or the past participle suffix *–tt.* If the suggested adjustment of including the present tense suffixes and the past participle suffixes in the "do count" list is made, no further adjustments are needed to accommodate the differences between English and Norwegian auxiliaries. *Har hatt 'have had'* will then be counted as 4 morphemes: "ha (1) + r (1) + ha (1) + tt (1)".

3.3.4. Nouns: plurality, gender and definiteness

In Johnson's list (2005) over which morphemes to count, the noun only has two, the genitive –s and the plural –s markers. This means that compound words, such as for instance *girlfriend*, will be given a value of one. *Girlfriend* and *girl* have the same MLU value, even though the former is built by the latter +*friend*. Furthermore, this also means that derivational morphemes are not to be counted. The compound *girlfriend* can be made into *ex-girlfriend* by adding the prefix *–ex*. This is a word derived from a compound word, but it still only gets the value one. According to Brown (1973), the reason compound words are only given a value of one is because the morphemes *girl* and *friend* in the compound *girlfriend* do not function as separate morphemes for young children.

While compounding and derivation create new words, or change the word class in the case of derivation, inflectional morphemes create a new word form. E.g. the plural *–s* does not change the meaning of a noun, but only represents that there is more than one of

the given noun. In a normal child's language, the plural form *apples* will be processed as *apple* + plural *–s* (Karmiloff and Karmiloff-Smith 2002). This means that from an early age, the plural form of a noun is not stored, but created through inflection from the singular noun. So while the derived or compounded noun is stored as separate from the source word/words, this does not hold true for the inflected word form. This is why the noun *girlfriends* would be given the value two, while *ex-girlfriend* would only be given a value of one. It is important to remember that the plural *–s* can also be expressed through the *–es* and *–ies* suffixes, as e.g. in *party-parties* or *fox-foxes*, so even in English there are more than one suffix to keep track of.

The problem by only counting plural and genitive *–s* in Norwegian, is that nouns in Norwegian have more inflectional morphemes than their English counterparts. In Norwegian, the plural suffix varies based on the gender of the noun. In addition the suffix changes depending on whether or not the noun is definite or indefinite, even when the noun is singular (Golden et al. 2008). In English, articles are used to show whether a noun is definite or indefinite. While there is also a difference between definite and indefinite articles in Norwegian, the articles are in most cases not needed to determine definiteness.

The genders in Norwegian are masculine, feminine, and neuter. Masculine and feminine nouns have mainly the same pattern of inflection, but the feminine gender has an optional suffix not available to the masculine gender. In the feminine singular definite, both *–a* and *–en* can be used, but in writing, the latter is used more than the former (Golden et al. 2008). Neuter, as shall be seen, has a different pattern altogether, with a difference in inflection between monosyllabic words and polysyllabic words. The main pattern of inflection is represented in the following table, adapted from Golden et al. (2008), where the suffixes are highlighted.

Table 3-6 Nouns: gender, definiteness, and plurality

Gender	Singular indefinite	Singular definite	Plural indefinite	Plural definite
Masculine	Elev 'pupil, student'	Elev**en**	elev**er**	elev**ene**
Feminine	Dør 'door'	Dør**a/-en**	Dør**er**	Dør**ene**
Neuter one syllable	Glass 'glass'	Glass**et**	Glass	Glass**ene/**glass**a**
Neuter multiple syllables	Eple 'apple' Vindu 'window'	Epl**et** Vindu**et**	Epl**er** Vindu**er**/vindu	Epl**ene**/epl**a** Vindu**ene** / vindu**a**

There are exceptions to these patterns e.g. the monosyllabic neuter noun *sted* 'place', which is *steder* in plural indefinite. Also, most polysyllabic neuter nouns ending with the letter *–e* are inflected in the plural indefinite form, while others, e.g. *vindu* 'window' can have either the *–er* ending in plural indefinite, or, optionally, have no ending at all (Golden et al. 2008).

As the plural *–s* is calculated according to the English MLU protocol (Johnson 2005), it makes sense that the suffixes used to represent plurality should be counted in a Norwegian protocol for calculating MLU. It makes sense to also count the definite markers, as they function as inflectional suffixes. The English equivalent to these suffixes are the articles *the*, *an*, and *a*, which are added to the noun phrase to create definite or indefinite forms in English. The two latter articles show that the noun is indefinite, while *the* shows the definite form. This means that the singular definite form of *ball* is *the ball*, having a MLU value of two. The Norwegian equivalent is *ballen* 'the ball', also worth two points if the masculine singular definite morpheme *–en* is counted.

When it comes to indefinite plural neuters, things get a bit more confusing as there is no plural indefinite morpheme for one syllable neuters, and most polysyllabic neuters that do not end with the letter *-e* have optional inflections (Golden et al. 2008). In table 3-6 above it can be seen that *vindu* 'window' can be written both as *vinduer* and *vindu* in the plural indefinite. According to the proposed adjustment to the MLU, *vinduer* will be given

the value two, as both *vindu* and *–er* will be counted, while *vindu* will be given the value one. So, even if both are grammatically correct, one is worth more than the other when calculating MLU, as there are more morphemes.

This rule of only counting morphemes also applies to those nouns that have other patterns of inflections than those in table 3-6. An example of such a pattern is that some masculine nouns get *–e* in plural indefinite and *–ne* in plural definite. The nouns that are inflected according to this pattern all end with *–er*. Nouns in this group often denote persons, are derived from nouns dealing with numerals or denote tools or apparatus, such as *tyrker-tyrker**en**-tyrker**e**-tyrker**ne*** 'a Turkish person', *lærer-lærer**en**-lærer**e**-lærer**ne*** 'teacher' and *tier-tier**en**-tier**e**-tier**ne*** 'a tenner, a 10-pund note'(Golden et al. 2008). Some nouns also get the *–er* suffix in indefinite plural, while others undergo both a vowel shift and get a suffix. There are also some masculine and feminine nouns that get no ending in indefinite plural, and some neuters ending with *–um* that can be inflected with either *–a* or *–umer* in indefinite plural and *–aene* in definite plural. Furthermore, most words ending with *–eum* or *–ium* lose the *–um* when inflected, and are inflected according to the main pattern. The noun *museum* 'museum' is therefore inflected in the following pattern: *museum-muse**et**- muse**er**-muse**ene**,* while *faktum* 'fact' is inflected as follows: *faktum, faktum**et**, fakt**a**, fakt**aene*** (Golden et al. 2008).

There are more exceptions to the main pattern showed in table 3-6, but a general rule for how to adjust the MLU protocol to fit the Norwegian language can be made from the examples previously mentioned. In addition to counting plurality markers, as is already part of the protocol for calculating an English value, markers for definiteness must also be counted in order to calculate a Norwegian MLU value. This includes irregular nouns that change vowel, as long as they also have a suffix, e.g. *datter-datter**en**-døtr**er**-døtrene* 'daughter' *(Golden et al*. 2008).

When trying to calculate MLU it is also important to remember what not to count. As mentioned before, irregular plurals are to be given a value of one. While it is proposed above that even nouns with irregular plural form should be counted as long as they have the plural suffix, there are some exceptions. In both English and Norwegian, some nouns do not

occur as singular. These nouns have the plural suffixes, but are still to only be given a MLU value of one. An example of such a noun in English is *pants (Johnson 2005)*, while *penger* 'money' is a Norwegian example. But *penger* is still inflected to form the definite plural. In other words, while *penger* 'money' in the indefinite plural only is given a value of one, the definite *pengene* should still be given a value of two, as it is inflected with the definite suffix *–ene*.

So, to shortly sum up, to find a Norwegian protocol for calculating MLU, markers showing gender, and indefinite and definite properties of nouns need to be added to the list of what to count, in addition to the plurality markers already listed in the "do count" part of Johnson's protocol (2005).

3.3.5. Nouns: possessive -s

The use of the possessive marker is very similar in English and Norwegian. In English the possessive marker, also known as possessive *–s* is usually preceded by an apostrophe. When the word ends with an *-s*, including regular plurals, the *-s* is often omitted, leaving only the apostrophe. An example of this is the singular "*the dog's ball"* and plural "*the dogs' ball"*. One exception is names that end with *–s*, where the possessive is often written in full, e.g. "*Agnes's ball*". It is also used in some phrases involving quantities of e.g. time and money. Consider for instance the phrases "in a week's time" and "a couple of dollars' worth (of something)". Here there is no true ownership, but the genitive *–s* is still there. In Norwegian, the possessive *–s* usually does not have an apostrophe before the *–s*. But when the marker is attached to nouns, usually names, ending with *-s*, *-x*, or *-z*, the *–s* is often omitted and replaced by an apostrophe, or the possessive is expressed by the use of either a possessive pronoun e.g. *si 'his,her,its,their'*, or the preposition *til '*to*' (Golden et al*.2008). The preposition *til* 'to' often demands a definite form of the noun being possessed. In other words the phrases "*Silas **si** bok"* and "*Boka **til** Silas*" are both equivalents of "*Silas's book*". The phrases "*Silas si bok*" and "*Silas's book*" have the same MLU value, but if definite markers are added in the "do count" list, "*Boka til Silas*" will have an MLU value of 4: "Bok (1) +a (1) +til (1) +Silas (1)". This is one more than the other two phrases "Silas (1) + si (1) +

bok (1)" and "Silas (1) +s (1) + book (1)". The possessive pronouns will be discussed in depth in the chapter dedicated to determiners.

Therefore, while the possessive markers are not used in exactly the same way, they are arguably so similar in use that there is no need to adjust the MLU protocol in order to account for the differences.

3.3.6. Adjectives

English adjectives are inflected to form the comparative and superlative forms. While Johnson's (2005) protocol does not mention adjectival inflection in either the "do count" or the "do not count" columns, the general rule is to count inflectional morphemes (Brown 1973). As they are not specifically mentioned in the "do not count" list, it is logical to assume that the adjective inflection morphemes are to be counted.

Norwegian adjectives are much more complex when it comes to inflection. Because while Norwegian adjectives are inflected to form the comparative and superlative forms, as in English, Norwegian adjectives are also inflected to agree with the nouns they describe when not in comparative or superlative form. This means that when a Norwegian noun appears in definite plural form, so must the adjective. The main inflection pattern is shown in table 3-7 using *kald*, the Norwegian version of the adjective *cold*, as an example (Golden et al. 2008).

Table 3-7 Adjectives: Main pattern of inflection

	Indefinite	Definite
Feminine and Masculine	Kald	kald**e**
Neuter	Kald**t**	kald**e**
Plural	Kald**e**	kald**e**

While the definite morpheme is the same for all genders, and indeed plurality, it is worth mentioning that the definite form is usually preceded by a definite article. This article

is *den* 'the' for masculine and feminine forms, *det* 'the' for neuter and *de* 'the' for plural, as opposed to the definite form of the English article, *the*, which is not inflected to agree with gender or plurality (Golden et al. 2008). "*The green ball*" and "*the green balls*" will be "*den grønne ballen*" and "*de grønne ballene*" in Norwegian.

Some adjectives follow this pattern but have special rules. According to Goldman et al. (2008) adjectives ending with a voiced vowel, and being pronounced with a short vowel sound when inflected in neuter, are spelled with a double consonant *–tt*, e.g. *fri-fri**tt*** 'free' and *ny-ny**tt*** 'new'. Furthermore, some of these adjectives have optional forms in plural. Either they can take the plural *–e* marker, or it can be omitted. The adjective *blå* 'blue' can for instance be either *blå* or *blåe* in plural. While *blåe* is a correct form of the adjective, it is far more common to use the form *blå* both in speech and in writing (Goldman et al. 2008). Most adjectives ending with a double consonant substitute the last consonant with the *–t* morpheme, when inflected in neuter.

There are some exceptions to this rule to separate the inflected adjective from other, similar adjectives, E.g. *full* 'full, drunk' is *fullt* in neuter, to separate it from *fult*, which is the adjective *ful* 'cunning' in neuter. Some adjectives ending with the letter *–m*, and having a short vowel sound before the *–m*, get a double *–m* when inflected. This is done because there is a general rule in written Norwegian stating that no words end with *-mm*. But when the *–m* is no longer the last letter, this rule no longer applies, and the word is written with *–mm* followed by a morpheme. The adjective *dum* 'stupid' for instance, turns into *dumme* when inflected in the definite or/and plural form. The *–m* added in this instance is not actually part of the morpheme, but is required by one of the rules governing written Norwegian. These are orthographic issues, as the vowel sound in the plural *dumme* 'stupid' is of the same length as in the singular *dum* 'stupid'. While these exceptions are important to remember while transcribing, they do not influence the MLU value, as e.g. *fullt* 'full, drunk' and *fult* 'cunning' are both counted as two morphemes: "full(1) + t(1)" = 2 and "ful (1) + t (1)" =2.

While more adjectives follow the main inflection pattern, but with small adjustments, the ones mentioned are enough to illustrate the complexity of Norwegian

adjectival inflection, within what is considered the main pattern of inflection. It can therefore be worth looking at some patterns of inflection that deviate from the main inflection paradigm. There is a group of adjectives that only have one singular indefinite form, meaning that they do not get the *–t* morpheme in singular indefinite neuter. These are adjectives ending with *–ing*, adjectives ending with a consonant + *–t*, and some specific words e.g. *slu* 'crafty, sneaky'*, sta* 'stubborn'*, edru* 'sober'*, glad* 'happy'*, redd* 'scared'*, fremmed* 'foreign*,* strange' and *solid* 'solid, massive'. Many adjectives ending with *–sk* also follow this pattern if they are polysyllabic or are words for nationalities or language (Golden et al. 2008). There are also special rules that apply when the adjective follows some verbs, and when the adjective appears with a preposition in some fixed phrases like *glad i* 'loves' or *vant til* 'used to, accustomed to' they are not inflected to agree with the subject. *Vant* in *vant til* looks like it is inflected in singular indefinite neuter, but it has this form regardless of the plurality, gender, and definiteness of the subject (Golden et al. 2008). There are some situations where the adjective does not directly describe a noun, but instead describes what the speaker/writer thinks about it. This happens when the noun is in the indefinite form, and the adjective describes taste or opinion, e.g. "fotball er morsomt" and "fisk er godt", which is "football is fun" and "fish tastes good" in English. Here the adjectives are not inflected to agree with the noun, and should be treated as irregular forms (Golden et al 2008).

As with nouns, it makes sense to count the adjectives inflected to agree with the gender, plurality and definiteness of the nouns they describe as two if they take an inflectional morpheme. This means that irregular forms that are not inflected to agree with the subject, e.g. *godt* 'good, tasty' in "fisk er godt" above, should be counted as one morpheme. This includes adjectives in fixed phrases, such as *vant* 'accustomed' in *vant til* 'used to, accustomed to', because the adjective is not inflected to agree with the definiteness, gender, or plurality of the subject.

Norwegian adjectives are inflected to form superlative and comparative forms, much in the same way as English adjectives are. While Johnson (2005) does not mention the inflectional morphemes used to form the comparative and superlative forms, it makes sense

to add them in the "do count" list, because Brown (1973) claims that all inflections should be counted. The main pattern of inflection is presented in table 3-8.

Table 3-8 Adjectives : Superlative and Comparative forms

Positive	Comparative	Superlative
Kjekk 'handsome'	Kjekk**ere**	Kjekk**est**

When inflected to form the comparative, the adjective is not inflected to show definiteness, number or gender. Adjectives inflected to form the superlative are, in contrast, inflected with the suffix *–e* when definite, and are, when definite, also commonly preceded by the definite article. This article agrees with the noun linked to the superlative adjective. Norwegian adjectives can in other words, be inflected to form a definite superlative form (Golden et al. 2008). The definite form of the superlative in table 3-8, would be *kjekk**este*** 'the most handsome', and should be counted as three morphemes "kjekk (1) –est (1)-e (1) ", if the proposed adjustment of also counting those morphemes used to inflect an adjective with regards to gender, definiteness, degree and plurality is taken into account.

So, to sum up, when calculating MLU values for adjectives, one should include the morphemes used to inflect for gender, definiteness, plurality and degree in the "do count" list. In addition, it is important to remember only to count the adjectives inflected with the neuter suffix *–t* as one when the adjectives are not inflected to agree with a noun, such as in fixed phrases.

3.3.7. Determiners

The English indefinite articles are *a* and *an*. *A* is used when the noun it refers to, or the word directly following the article, begins with a consonant sound. *An* is used when it is followed by a vowel sound. The Norwegian indefinite articles are *en* 'a, an'*, ei* 'a, an', and *et* 'a, an'. In Norwegian, the gender of the noun the article refers to, determines the article. *En* is masculine, but can also be used on feminine nouns, *ei* is solely feminine, and *et* is neuter.

A very common definite article in English is *the.* There is no article in Norwegian that has the same role as *the*, as this role is fulfilled by the definite suffixes presented and discussed subchapter 3.3.4

That is another definite article, and the Norwegian counterparts are *den*, *det*, and *de*. *Den* is masculine and feminine, *det* is neuter and *de* is plural. While the articles have different forms according to gender and number, they are treated as separate morphemes. This means that e.g. *den* is not viewed as being *d* inflected with the suffix *–en*. It therefore makes sense to give *den, det* and *de* MLU values of one. *Den, det,* and *de*, when used in the same way of *that* are followed by the definite form of the subjective. This means that the phrase "that boy" is "den gutten" in Norwegian.

The English demonstratives *this* and *that*, which are also definite determiners, are inflected to show plurality. *These* is the plural of *this*, and *those* is the plural of *that*. The Norwegian counterparts for *this* and *these* are *denne* 'this, masculine or feminine', *dette* 'this, neuter', and *disse* 'these'. *That* and *those* can be translated into *den* 'that, masculine and feminine', *det* 'that, neuter' and *de* 'those'. Again, while these demonstratives have different forms depending on number, and, for the Norwegian demonstratives, gender, they are not viewed as being formed by adding inflectional suffixes to a stem (Golden et al. 2008). This means that these determiners are to be given the MLU value one in both English and Norwegian, and no changes need to be made to Johnson's protocol. "Den gutten" therefore has an MLU of 3, "den (1) gutt (1)-en(1)" while the English "that boy" has an MLU of 2 "that (1) boy (1)"

The difference between English and Norwegian when it comes to possessive pronouns is that in Norwegian, some of the pronouns are inflected in order to agree with gender. Furthermore, the Norwegian possessive *sin* can be both singular and plural, and is a reflexive possessive. Only *min* 'my', *din* 'your, singular', *sin* 'her, his, its, their', and *vår* 'our' is inflected. They follow the pattern described in table 3-9.

Table 3-9 Determinatives: Possessive pronouns

	Masculine	Feminine	neuter	plural
Singular				
1.person	Min 'my'	Mi/min	Mitt	Mine
2. person	Din 'your, singular'	Di/din	Ditt	Dine
3. person	Sin 'her,his,its'	Si/sin	Sitt	Sine
Plural				
1.person	Vår 'our'	Vår	Vårt	Våre
2. person	Sin 'their'	Si/sin	Sitt	sine

As can be seen it is only in neuter and plural that a morpheme is added to the root form. It is worth noting that the feminine *mi* form is used if the noun takes the feminine *–a* ending, and *min* is used with the *–en* ending. Whether or not the possessive is in the *min* or *mi* form, it does not take a morpheme, and should therefore be counted as one. This would mean that possessive pronouns, as with adjectives, should only be counted as two when inflected in the neuter and plural forms.

The possessive forms *deres* 'your, plural' , *hans* 'his', *hennes* 'her', *dens* 'its', and *dets* 'its' are not inflected to agree with the possessed noun, but agree with the possessor, as they are formed by adding the possessive marker *–s* to the pronouns *dere* 'you, plural' *han* 'him, he', *henne* 'she, her', *den* 'the, masculine or feminine' and *det 'the, neuter'*. These should therefore be counted as two, as they are inflected in the same manner as the subject they replace, as can be seen in the following phrases: "Det er Pers ball" 'it is Per's ball' and "det er hans ball" 'It is his ball'.

Determiners, in general, follow the pattern of the adjectives, in that a determiner is not inflected in masculine and feminine, but in neuter and plural they are inflected with the neuter *–t* and plural *–e* morphemes.

3.3.8. Written Bokmål vs. spoken Nordfjord dialect

As there are many different dialects in Norway, there are, as in other languages, marked differences between the spoken and written language. The parents of the children recorded in this study come from the same area, and speak the same dialect. This dialect is known as "Nordfjord dialect", named after the fjord around which the settlements are located. Fortunately, this dialect follows the written rules for inflection quite closely, but with some exceptions. These differences will be presented in the same order as the written issues were presented, where applicable.

3.3.9. Verbs

The Nordfjord dialect use the *-a* suffix when applicable, so, to use verbs from table 3-3, one would say *vaska* 'to wash' instead of *vasket* 'to wash' in the past tense. These are also accepted in the written language. When it comes to the present tense inflection, however, there is a difference. Someone speaking the Nordfjord dialect will e.g. inflect *vaske* 'to wash' as *vaska* in the present tense, and not as *vasker* as is the written norm. This seems to be a general rule regarding all verbs inflected with the *–a* suffix in past tense. When calculating the MLU value, this does not pose a problem if the dialect *–a* suffix is either counted as a separate morpheme, or transcribed into the orthographically correct *–r* suffix.

Verbs that are not inflected with the *–a* suffix in past tense are also inflected differently in the Nordfjord dialect, as the present tense suffix *–er* is not fully pronounced. Someone from Nordfjord would say *kjøre* and not *kjører* 'to drive' in the present tense. This is the case for most verbs ending with the suffix *–e* in the infinitive that are not inflected with the suffix *–a* in the past tense. So while the *–r* in the present tense suffix *–er* is not pronounced in *kjører* 'to drive', the present tense suffix *–r* is in the present tense form of *bo* 'to reside', *bor,* as *bo* does not end with the suffix *–e* in the infinitive. While this might prove a problem orthographically, it is not a big problem when calculating MLU, because the morpheme that is actually pronounced, *-e,* in the dialect variant of the present tense form of *kjøre* 'to drive' has the same MLU value as the orthographically correct *–er* in *kjører.* It is

therefore unproblematic to transcribe the dialect variant *kjøre* into the correct written form *kjører*.

Aside from these exceptions of present tense inflection, speakers of the Nordfjord dialect pronounce the verbal inflectional suffixes very closely to their written forms.

3.3.10. Nouns

As is the case in verbal inflection, the Nordfjord dialect inflects with the suffix *-a* when possible. This means that feminine nouns are inflected with *–a* in the definite singular, and neuters in definite plural. Furthermore, it is a general pattern that the *–er* ending is pronounced as *–e* both for feminine and neuter nouns. Therefore, *dør* 'door' and *eple* 'apple' are pronounced *døre* and *eple* in indefinite plural. The same goes for the neuter definite singular morpheme *–et*. So *eple*, to use the example above, is pronounced *eple* in both the definite and indefinite singular, and the indefinite plural. This means that when the noun ends with an *-e* in the indefinite, there is no difference in pronunciation between the indefinite singular, definite singular, and indefinite plural for neuters, and between indefinite singular and indefinite plural for feminine nouns ending with *–e*. This poses a problem both for transcribing, and for calculating MLU, as multiple forms of the word are pronounced without any discernible difference. It therefore makes sense to transcribe e.g. *eple* as the indefinite singular, giving it a MLU value of one. This method might underestimate the child's grammatical ability, but on the other hand, if one simply tries to guess what form of the noun the child is going for, it might overestimate the child's grammatical ability. While this is important to remember, it does not require a change to the MLU value to accommodate these issues.

When it comes to masculine nouns, there are differences between the Nordfjord dialect and written Bokmål in the plural forms. The indefinite plural suffix *–er* in written Bokmål is substituted with the suffix *–a* in the dialect version, and the definite plural suffix *-ene* is pronounced *–ane* in the dialect. This means that the masculine noun *elev* 'pupil, student' takes the following plural forms in the Nordfjord dialect: *eleva-elevane*. When calculating MLU these forms are unproblematic, as *elev+a* and *elev+er* have the same MLU

value. The same is true for *elev+ane* and *elev+ene.* Transcribing the dialect variants into the correct written forms is therefore acceptable, as it will not lead to any problems when calculating MLU.

While there might be other instances where speakers of the dialect pronounce the inflectional morphemes differently from the written norm, the patterns mentioned before cover the most important differences between the Nordfjord dialect and Bokmål when it comes to nominal inflection.

3.3.11. Adjectives

The differences between Bokmål and the Nordfjord dialect are the pronunciation of the comparative and superlative suffixes *–ere* and *–est*. To use the example from table 3-8, *kjekk* 'handsome, fun', the comparative form in the dialect is *kjekk**are*** and the superlative form is *kjekk**ast**.* Adjectives inflected to form the superlative are still inflected with the suffix *–e* to form the definite form, so the definite superlative of *kjekk* looks like this *kjekk**aste*** in the dialect, compared to *kjekk**este*** in Bokmål. This does not pose a problem when transcribing or calculating the MLU value, as *kjekkaste* can easily be transcribed as the correct form *kjekkeste* as it has the same MLU value. The same holds true for the indefinite superlative and the comparative forms as well. These differences are, in other words, important to know about, but they do not require a change in the MLU protocol to accommodate them.

3.3.12. Nordfjord dialect vs. Bokmål conclusion

As can be seen, there is no need to change the MLU protocol to accommodate any of the differences between Bokmål and the Nordfjord dialect. While there are some differences, the dialect mostly follows the written norms, and where it does not, it is usually acceptable and unproblematic to transcribe the dialect into Bokmål, and still get the same MLU value.

3.3.13. The protocol for calculating Norwegian MLU values

When it comes to how verbs are inflected, aside from the present tense suffixes, the sheer amount of different past tense suffixes used in Norwegian inflection is the greatest difference between Norwegian and English. But the fact that the past tense marker can be represented in different ways in Norwegian is not a problem when calculating MLU, as the protocol already states that the past tense marker is to be counted. Whether or not that marker is spelled *–de* or *–dde*, is not important, as long as one remembers to count the past tense morpheme present.

The biggest difference in nominal and adjectival inflection between English and Norwegian is that there is no inflection to agree with gender and definiteness in English. The protocol for calculating MLU has to be adjusted to include these inflections when trying to calculate Norwegian MLU values. Some specific cases also have to be added to the list detailing what forms that are to be counted as one morpheme, as there are some irregularities in how some nouns and adjectives are inflected. This makes sense, as irregular past tense and irregular plurals are to only be counted as one morpheme in English (Johnson 2005, Brown 1973).

So, while English and Norwegian are fairly similar languages, they are e.g. both Germanic SVO languages, there are also many differences between the two. Using the current protocol for calculating both English and Norwegian MLU is questionable, and the adjustments mentioned are necessary to create a protocol for calculating Norwegian MLU values. The proposed protocol is presented in Table 3-10.

Table 3-10 Protocol for calculating MLU, adjusted to be applicable to Norwegian

How to count morphemes	
Method:	
1	Select 100 completely intelligible utterances (i.e. if even one word in an utterance is not understood, that utterance is excluded from the analysis. Words that are unintelligible are transcribed as x.)
2	Count the morphemes in each utterance according to the guidelines set out in the 'DO count' and 'DO NOT count' sections below.
3	Add the number of morphemes for all 100 utterances to give a total number of morphemes used.
4	Divide the total number of morphemes used obtained in step 3 above by 100 to get the mean length of utterance.
DO count:	
1	The plural markers (e.g. *cat-s, dog-s*). Count it even when used on irregular plurals (e.g. *mouse-s*). [Exception: plurals never occurring in the singular (e.g. *pants, clothes*) count as just one morpheme.]
2	The past tense markers (*walk-ed, play-ed*). The past tense morpheme is counted even when used improperly (*go-ed, drink-ed*).
3	The -ing present participle marker (e.g. *walk-ing, count-ing*).
4	The -s 3rd person regular tense marker (e.g. *he like-s sweets, Bob walk-s fast*). [Exception: *does* counts as one morpheme.]
5	Possessive -'s marker (e.g. *mummy's hat, boy's toy*).
6	Contractions (e.g. *she's, he'll, they're, what's, she'd, we've, can't, aren't* would all count as 2 morphemes each). [Exceptions: *let's, don't* and *won't* are assumed to be understood as single units, rather than as a contraction of two words, so are just counted as one morpheme.]
7	Present tense suffixes (Norwegian exclusive)
8	Past participle suffixes
9	Infinitive suffix (Norwegian exclusive)
10	Gender suffixes (Norwegian exclusive)
11	Suffixes showing definiteness (Norwegian exclusive)
12	Comparative and superlative suffixes
DO NOT count:	
1	False starts, reformulations, or repetitions unless the repetition is for emphasis (e.g. "[then] then [he go] he went to the zoo" is counted as 6 morphemes; "No! No! No!" is counted as 3).
2	Compound words, reduplications, and proper names count as single words (e.g. *fireman, choo choo, Big Bird*).
3	Irregular past tense verbs and irregular plurals count as one morpheme (e.g. *took, went, mice, men*).
4	Diminutives (e.g. *doggie, horsie, dolly*) and catenatives (e.g. *gonna, wanna, hafta*) count as one morpheme.
5	Fillers (e.g. *um, well, oh, um hmm*).
6	Instances where either a) a suffix is present but do not act as an inflectional morpheme as e.g. *–t* suffix in "*van**t** til"* 'used to, accustomed to', or b) the instances where the word incidentally ends with the correct letter/letters of a suffix, but is not inflected e.g. *–te* and *–de* in the past forms *måtte* 'need', *burde* 'should', and the *–t* in adjectives ending with a consonant +t e.g. *svart* 'black' and *smart* 'smart'. (Norwegian exclusive)

3.4. Method

The subjects in this study are a girl I will call JK, and a boy I will call S. Both children are Norwegian monolinguals of approximately the same age. S is the oldest, being a month and a day older than JK. Both children attend kindergarten, and their caregivers have approximately the same academic background. Both mothers have bachelor degrees and work in the Norwegian healthcare system, and the fathers studied vocational subjects in high school. As both children are also growing up in the same village, it can be said that they have very similar backgrounds. The children have not shown signs of atypical language development, and it is therefore presumed that both are developing normally.

This study is based on two methods of data gathering, the CDI forms and audio recordings. The caregivers were asked to fill out the CDI forms three times, once at the beginning of the period, one in the middle of the period, and one at the end of the period. In addition to filling out the CDI forms, they were instructed to get approximately 15-30 minutes of audio recording each month. They started to record in January 2012, and stopped recording in June 2012. S was approximately 21 months at the onset of the study, as he is born on the last day of March 2010, and JK was approximately 20 months, being born on the first day of May.

It is harder to gather data from two children simultaneously than focusing only on one child. However, there are also certain advantages. It makes sense considering the lack of Norwegian language acquisition data. Having data from two children enables the investigator to compare the acquisition data from one child with the data from the other. Also, if something goes wrong when recording or gathering data from one of the children, there is still the possibility of gathering good data from the other child. As will be explained in the results chapter, this proved to be prudent.

The recordings were sorted according to months, and the MLU value was calculated for each month. After having calculated the CDI scores, a comparison between the development of the CDI scores and the development of the MLU values were made in order to determine if an increase in vocabulary coexisted with an increase in grammatical proficiency; as observed by Bates and Goodman (1997). A prediction at the onset of this

study is that the child with the highest increase in vocabulary will also have the largest increase in MLU.

While there is little available data concerning Norwegian MLU norms, this is fortunately no longer the case for CDI values. The children's CDI values can therefore be compared to the results from the Norwegian CDI norming study (Kristoffersen et al., 2012). This study contains both a combined national mean, and separate scores for boys and girls. The results of S and JK are therefore compared both to each other, and to the results of other boys and girls of the same age. This was done to double check that the CDI scores of S and JK were within the normal range.

To calculate the MLU values, a protocol for calculating Norwegian MLU values was developed based on Johnson's protocol (2005) for calculating English MLU values. As this is a brand new protocol, it was of interest to see if the Norwegian values were similar to English values, e.g. values from Miller's study (1981). If the results are too dissimilar, it might mean that the Norwegian protocol proposed in this study is faulty, or that MLU cannot be used as a comparative tool between English and Norwegian language development.

The results are presented in the following chapter.

4. Results

In this chapter, the CDI and MLU results will be presented, compared and discussed. First the CDI results of S and JK will be presented and compared to both each other, the Norwegian CDI norming study (Kristoffersen et al., 2012), and the results from Dale and Fenson's study (1996). Then the MLU values will be presented and discussed, but unfortunately there is no current data on Norwegian MLU in the literature, so these values will be compared to Miller's values (1981). At the final part of the results chapter, the MLU and CDI values will be compared in order to see if

1) The CDI results are close to the CDI norming study, and
2) The MLU results for S and JK are quite similar, and the child with the highest productive vocabulary, as measured on the CDI, also has the highest MLU.

If both 1) and 2) are correct, this indicates that the revised MLU protocol works, and that the size of a child's vocabulary affects that child's current grammatical proficiency. Bates and Goodman's (1997) claim that it is possible to predict the grammar development of a child, based on the vocabulary size at certain points of acquisition. They also claim that there is a connection between vocabulary size and contemporary grammatical proficiency. The results they presented in the paper discussed in chapter 2 supports these claims. The close link the results displayed between the acquisition of lexemes and the acquisition of grammar in English and Italian makes it interesting to search for a similar connection in Norwegian.

As the children in this case study are Norwegian, and Bates and Goodman (1997) based their conclusion largely on data from the English language, finding a connection between vocabulary size and grammatical proficiency in the present study might mean that their claim is also true for children acquiring Norwegian. The MLU will also be compared to the complete number of words in the CDI, that is productive and comprehension values combined. But as the norms from Norway and America are from studies in productive vocabulary, this is where the main focus will be.

4.1.The productive CDI results

Unfortunately, all did not go according to plan when collecting the CDI forms. The last forms were not collected until early July, a full month after the investigator had stopped recording. This is unfortunate, as there are no data for the month the recordings stopped, but it still gives an indication for the rate of acquisition for the two children. The CDI results are presented in table 4-1 and 4-2 below.

Table 4-1 JK`s productive CDI results and Norwegian/National and American norms for girls

Age in months	JK	National/Norwegian norms	American norms
21	184	217.9 (SD 145.7)	222.0 (SD 166.4)
23	246	332.1 (SD 151.0)	325.3 (SD 178.9)
26	455	477.8 (SD 161.4)	409.7 (SD 175.2)

(National norms from Kristoffersen et al., 2012; and American Norms from Dale and Fenson, 1996)

Table 4-2 S`s productive CDI results and Norwegian/national and American norms for boys

Age in Monts	S	National/Norwegian norms	American norms
22	146	198.2 (SD 159.2)	215.2 (SD 162.2)
24	336	297.4 (SD 162.2)	277.9 (SD 171.5)
27	559	400.9 (SD 186.0)	372.2 (SD 180.4)

(National norms from Kristoffersen et al., 2012; and American Norms from Dale and Fenson, 1996)

4.1.1. JK's productive CDI results

As can be seen, JK's results are never actually on the national mean, but they are very close, and well within the standard deviation. Worth noting that they are also within the SD of the American norms, indicating that early vocabulary development is fairly similar between Norwegian and English, at least at the beginning. At 26 months the Norwegian and American means are some ways apart, but still within the SD of each other. JK's results indicate that her rate of acquisition is fairly typical, both for a Norwegian child and an American child. This indicates that comparing Norwegian and English acquisition data for vocabulary sizes is plausible. It is also worth noting that while JK`s results are within the national SD at all times, her results are always somewhat below the national mean. JK is reported to have increased her productive vocabulary by 271 words (455-184) in total.

4.1.2. S's productive CDI results

S's results are also within the SD of the Norwegian mean, but they are not as close to the Norwegian mean as JK`s. When S is 22 months old, his vocabulary is reported to be below both the national mean and JK`s when she is 21 months old. However, as both the Norwegian and American norms indicate (Kristoffersen et al., 2012; Dale and Fenson, 1996) this is fairly typical, as the norms for girls are higher than the norms for boys. This is very interesting as S`s 2nd and 3rd CDI results are not only higher than the norms for boys, but also higher than both JK`s and the norms for girls. He is reported to have ended up producing 559 of the words on the CDI, having acquired a total of 413 new words in his productive vocabulary, and ended up with a result that is above the American norms for boys his age.

4.1.3. Comparison between S and JK`s productive CDI scores.

As can be seen, S starts off having fewer words in his CDI than JK, and is reported to have more words in his CDI than JK at the end. In the space between the first and second CDI measurement, S learned 190 new words (336-146), while JK is reported to have learned 62 (246-184) new words in the same amount of time. Between the 2nd and 3rd CDI evaluations, JK spoke 209 new words, and S spoke 223 new words. This means that while JK's rate of learning new words increased greatly, from 62 new words in two months to 209 words in three months, she was still somewhat behind S. Also worth noting that JK's increase in the productive vocabulary is closer to the Norwegian mean than S's rate.

While the initial amount of words S had in his productive vocabulary at the start of the period was unexpected, as he is older, the gap between JK and S at the end of the period was also unexpected. After all, at the beginning only 38 words separated them, but at the end S knew 104 more CDI words than JK. According to the Norwegian mean, the mean difference in the productive vocabulary between 26 months old girls and 27 months old boys is 76.9 words, as measured on the CDI, in the girls` favour (Kristoffersen et al., 2012). This means that the expected CDI results would show that S at 27 months old would be behind a 26 months old JK. But even if the results were a bit unexpected, both children are within the SD of their respective Norwegian and American norms, with the exception of

S`s end score, which is above the American norm for boys. This indicates that both children are acquiring language at rates that are normal for Norwegian children. The z-scores discussed below further support this.

4.1.4. Z-scores for S and JK

It is very common to use z-scores to determine the accuracy of results, when one knows both the population mean and the population SD (Thomas, 2005). A z-score is a numerical representation of how close the raw data are to the population mean. If the result is between -1 and 1 it is within the SD. This makes it a great tool for comparing the CDI results of JK and S, as they have different means and SD. If both children get a z-score of, e.g. 0.5, it means that they are equally close to the population mean, and are acquiring language at an equally expected/unexpected rate. The formula for calculating the z-score is $z=(x-m)/SD$, where x is the result of either S or JK, m is the corresponding population mean, and SD the corresponding population standard deviation (Thomas, 2005). Both JK and S are Norwegian, so it is natural to use the Norwegian means to calculate the z-scores. The results are presented in the tables below

Table 4-3 JK`s z-scores

Age	Z=score
21	-0.233
23	-0.570
26	-0.141

Table 4-4 S`s z-scores

Age	Z-score
22	-0.328
24	0.238
27	0.85

As can be seen from the table 4-4, S went from having a z-score of -0.328 to a z-score of 0.85. This means that he went from lying under the mean at 22 months of age, to lying above the Norwegian mean. At both ages, he is within the SD, as the z-scores are never below -1, and never above 1.

JK, on the other hand, always had negative z-scores. As with S, JK`s scores are higher at the last calculation. This means that the z-scores increased in the research period for both children, but JK was never above a negative number. It is interesting to see that JK`s z-score is at its lowest when calculated for the CDI result at 23 months of age. She was never as far from the national mean as at this point. This indicates that between 21 months and 23 months of age, her rate of acquisition was markedly lower than between 23 months and 26 months of age, as discussed in 4.1.3.

All in all the z-scores show that JK and S both acquire new words at normal rates, even though JK`s rate is lower than S`s, and slightly lower than the national mean

4.1.5. The combined productive and comprehension scores

Table 4-5 JK`s combined scores

Age	Production	Comprehension	Combined
21	184	168	352
23	246	43	289
26	455	46	501

Table 4-6 S`s combined scores

Age	Production	Comprehension	Combined
22	146	294	440
24	336	245	581
27	559	107	666

When looking at the comprehension numbers, they go down for both children. This can be explained by the finite number of words on the CDI: WS form. When a word is moved from the comprehend category and into the production category, the numbers go down in comprehension and up in production. When looking at JK's numbers, this does not seem to be the case. At least between the numbers reported at 21 months, and the numbers reported at 23 months. According to the numbers, JK's combined vocabulary size went down by 63, meaning that JK is supposed to have lost 63 words in her mental lexicon during this period. So while JK's productive CDI numbers are developing at approximately the same

rate as the Norwegian mean in this period, the combined amount of words in her CDI is reported to go down. As it is highly unlikely that this is the case, the reason might be one of the inherent weaknesses of parental reports. According to Bates and Goodman (1997), parents lose track of their children's receptive vocabulary after approximately 16 months. This means it is possible that JK's comprehension score was either exaggerated at 21 months, or it was underestimated at 23 months. It is most likely that the latter is the case, as it is likely that JK's comprehension numbers would drop in the same manner as S's, though not necessarily at the same rate. S's results are more to be expected, as the combined productivity and comprehension numbers, as measured on the CDI, go up, and the comprehension values go down as the words S learns to produce are moved from the comprehension category to the production category.

As it is difficult for the parents to track comprehension after the age of 16 months (Bates and Goodman, 1997) this raises the question of whether or not the comprehension values are valid. This is why the main focus of the comparison between MLU and vocabulary is on productive vocabulary.

4.2.MLU results

When measuring MLU it is stated in the protocol that one is supposed to pick the 100 longest utterances, and calculate the MLU from these (Johnson 2005). Unfortunately, this was not always possible in this study, as the recordings did not always yield 100 useable utterances. This is especially true for JK in April and February, and S in January and June, as there is little recorded data from this period. Therefore the results will be presented in table 4-7 on the following page with both the total amount of morphemes for the utterances, and the number of utterances from which these morphemes are calculated, instead of simply giving the MLU values. The numbers are rounded off so that they only have two decimals, this makes it easier to compare them to Miller`s numbers (1981). While the MLUs will be compared, it is very important to remember that if e.g. S`s MLU results are equal to the age equivalents, this does not necessarily mean that S`s is at the correct grammatical proficiency level. There are two important reasons for this. First of all, the numbers gained from S and

JK are from the Norwegian language, while Miller`s are from the English language. This means that e.g. an MLU of 1.92 might be age appropriate for a 24 month old English child, but it does not necessarily mean that it is age appropriate for a Norwegian 24 month old child. This leads to the second reason for being cautious, as there is no Norwegian MLU norming study, and the protocol used for calculating MLU in this study is a modified version of a common English protocol (Johnson, 2005). However, Miller`s numbers (1981) might give a small indication of what can and cannot be expected. There is no reason to believe that a Norwegian child should be more than 4-6 months ahead or behind their American acquisition colleagues.

It is worth noting that the numbers behind the names of the months are the ages of JK and S. The first number is JK, and the second number is S. Also, when comparing the MLU results, the focus will be on the results obtained when the children were between 22 and 25 months old. The reason for this is that while we have data from when JK was 20 months old, there is no data from S at this age. As there is data from both children between the ages 22 and 25 months, it is viable to compare these results. The age equivalents (Miller, 1981) are shown in table 4-8

Table 4-7 MLU results

Month	JK	S
Jan (20/21)	57/43 = 1.33	
Feb (21/22)		158/100 = 1.58
March (22/23)	94/65 = 1.45	88/55 = 1.6
April (23/24)	26/14 = 1.86	225/100 = 2.25
May (24/25)	310/100 = 3.1	231/100 =2.31
June (25/26)	202/94 = 2.15	

Table 4-8 Age equivalents

MLU	Age equivalent (within 1 month)
1.31	18
1.62	21
1.92	24
2.54	30

(Miller 1981)

4.2.1. Explanation to age equivalents

As seen in table 4-8, Miller`s (1981) age equivalents are presented in intervals. When comparing the MLU calculated for JK and S with Miller`s numbers some guidelines have to be followed. Take the MLU calculated for JK in January, as an example. In January JK had an MLU of 1.33, and her age is 20 months. As she is 20 months, her MLU score should be between the age equivalents for 18 and 21 months (Williamson 2009) if she was an American. From table 4-8 on the previous page we can see that her score should therefore be between 1.31 and 1.62, which it is, indicating that her MLU is appropriate for an American at 20 months of age. Whether it is appropriate for a Norwegian child is not known.

4.2.2. JK`s MLU results

JK`s results are very interesting, as there are some anomalies. The MLU values are within the age equivalents in January, April and June, but they are not in March and May. In March, she had an MLU of 1.45, and she was 22 months old. As seen from table 4-8, this means that her MLU is lower than it should be if she had been acquiring English, as it should be between 1.62 and 1.92. It is also worth noting that the MLU at 20 months is also a bit low when compared to the American MLU numbers (Miller, 1982), even though it is within the appropriate age equivalent interval. Her MLU was 1.33 at this point, very close to the American age equivalent at 18 months. It is therefore very possible that the MLU calculated in March is correct, but it is impossible to say whether it was high or low for a Norwegian girl.

The MLU from May is worrying. An MLU of 3.1 is much higher than her other results, and the appropriate age equivalent interval is between 30 and 33 months. In other words, this result would indicate that her grammatical proficiency is on the same level as a child 6 months her senior. This is highly unlikely as the other MLU results do not support this. An explanation for this abnormally large MLU might be that the proposed MLU protocol is faulty. But if this was the case, one would expect to see more abnormal results both for JK and for S, as the same protocol is used to calculate the results for both children. As JK`s May

MLU is the only result that really stands out as implausible, it is unlikely that the problem lies with the protocol.

There is also the possibility that the utterances recorded that month were especially long and heavily inflected. And this seems likely, as the MLU result for June is 2.15, well within the normal range for American MLU, and much closer to her other results. In other words, the result MLU result for May will be treated as an anomaly, as the other results are either within the age equivalent, or close to it. This indicates that she is acquiring inflectional morphemes close to the same rate as an American child, but it is unknown if this is the rate typical for a Norwegian child.

4.2.3. S`s MLU results

The results for February and March are slightly below the age equivalent interval, while the result for April is slightly above the average and the result for May is well within the age equivalent interval. There is a very small difference between the February and March results, as the MLU for March is only 0.02 higher than the MLU for February. There is also a very large jump from March to April, where the difference between the April MLU and the March MLU is 0.65. As the only comparable result as of yet is JK`s MLU and that his March result is somewhere between her March and April results, this might be a little low, as he generally has higher MLU scores than JK. But as it is not much lower than JK`s result, the result might be accurate. It might also be slightly lower than what it should be, as the difference between his February and March results are lower than the difference between his March MLU and his May MLU. But whether or not the MLU is lower or higher than it should be is hard to determine without other Norwegian MLU results. The relatively small difference between S and JK`s results do seem to indicate that the protocol is giving stable and accurate results, but without a large scale norming study, it is impossible to know. All in all, S`s results are promising, though they are a little way away from the American age equivalents.

4.2.4. Comparison between S and JK`s MLU results

At 22 months of age, S had an MLU value of 1.58, and JK had 1.45. At 25 months S had 2.31, and JK had 2.15. This means that S had a 0.73 increase in MLU from 22 to 25 months of age, while JK had a 0.7 increase. The MLU results indicate that S and JK are acquiring language at a very similar rate, with S being slightly ahead of JK. The 0.03 difference between S and JK's MLU increase, also indicate that the proposed protocol is plausible, and the close proximity between the MLU numbers from S and JK and Miller's age equivalents (1981) indicate that numbers from Norwegian MLU studies using this protocol are comparable to the numbers from the English protocol.

4.3. Comparison between the CDI and MLU results

After having looked at the CDI and MLU results, it is time to compare them to see if the results support Bates and Goodman's hypothesis (1997). If the hypthesis is true, we should see a connection between the productive vocabulary size and the grammatical proficiency of the children (Bates and Goodman 1997), in that the child with the highest productive vocabulary should also have the highest MLU score. S and JK's MLU and CDI are shown in tables 4-9 below and 4-10 on the following page, along with the Norwegian and American CDI mean, and the MLU intervals.

Table 4-9 S`s MLU and CDI

Age	CDI	MLU	Norwegian Mean CDI	American Mean CDI	Age equivalent interval
22	146	1.58	198.2 (SD 159.2)	215.2 (SD 162.2)	1.62-1.92
23		1.60			1.62-1.92
24	336	2.25	297.4 (SD 162.2)	277.9 (SD 171.5)	1.92
25		2.31			1.92-2.54
27	559		400.9 (SD 186.0)	372.2 (SD 180.4)	1.92-2.54

(National norms from Kristoffersen et al., 2012; and American Norms from Dale and Fenson, 1996; Age equivalents from Miller, 1981)

Table 4-10 JK`s MLU and CDI

Age	CDI	MLU	Norwegian Mean CDI	American Mean CDI	Age equivalent interval
20		1.33			1.31-1.62
21	184		217.9(SD 145.7)	222.0 (SD 166.4)	1.62
22		1.45			1.62-1.92
23	246	1.86	332.1 (SD 151)	325.3 (SD 178.9)	1.62-1.92
24		3.1			1.92
25		2.15			1.92-2.54
26	455		477.8 (SD 161.4)	409.7 (SD 175.2)	1.92-2.54

(National norms from Kristoffersen et al., 2012; and American Norms from Dale and Fenson, 1996; Age equivalents from Miller, 1981)

4.3.1. S's MLU and CDI

At 22 months S's productive vocabulary as measured on the CDI is lower than expected, though the CDI is within the SD for both the Norwegian and American numbers. The MLU is lower than the American age equivalent at this stage, but it might slightly lower or higher than where it should be for a Norwegian child. However at 24 months, the CDI is above the Norwegian and American mean, and the MLU is above the age equivalent. This means that between the ages 22 and 24 months both the vocabulary, as measured on the CDI, and the grammatical proficiency, as measured by MLU, went from below average to above average for both the Norwegian CDI norms, and the American CDI and MLU norms. This supports Bates and Goodman's (1997) claim that acquisition of new words and grammatical development are linked.

4.3.2. JK's MLU and CDI

While JK`s productive vocabulary, as measured on the CDI, is below the Norwegian mean at all times, and the American mean at ages 21 and 23 months, this does not seem to always be the case for her MLU. While her MLU at 20 is just within the American age equivalent and her MLU at 23 is slightly lower than the age equivalent, they are relatively close to each other. Her MLU at 22 is also quite close S`s MLU at the same age, as only 0.13

separate them. At 23 and 25 months, her MLU is never further than 0.28 from S`s results. This indicates that the protocol for determining Norwegian MLU works.

Also worth noting that, if overlooking the abnormal result at 24 month of age, the MLU results all increase. At no month does she get a lower or equal result on her MLU to the month preceding it, and this also holds true for her vocabulary, as measured on the CDIs. This means that her grammatical proficiency and vocabulary size were both increasing in the research period.

Overall, JK's results are quite puzzling and cannot be used as proof either in favour or against Bates and Goodman's (1997) claim. But because her MLU values are mostly within the American age equivalents, and close to S`s MLUs, and that the productive vocabulary numbers on her CDI are always close to the national mean, the results do seem to indicate that when the vocabulary is developing at the normal rate, so does the grammatical proficiency.

4.3.3. Comparison and discussion of the results.

As seen, S's results seem to support Bates and Goodman's claim (1997) that the acquisition of new words and grammatical proficiency are linked. After all, when S's MLU is below the age equivalent, his vocabulary is measured to be below the national mean, and when his MLU is within or above the age equivalent, his productive vocabulary, as measured on the CDI, is reported to be above the national mean. JK's results, on the other hand, can be interpreted to argue either in favour or against Bates and Goodman's (1997) claim. Also, S is reported to having acquired 142 more words than JK, and one would therefore expect S to have had a greater increase in MLU than JK. The difference between JK's MLU scores at 22 and 25 months of age is 0.7, while S has a difference of 0.73. This means that even though S acquired a significantly greater amount of words, his MLU only increased 0.03 more than JK's. So while the child with the greatest increase in vocabulary also had the greatest increase in MLU, the increase in MLU was not significantly greater. It does, however, give credence to the Bates and Goodman's claim (1997). Moreover, as mentioned in chapter 4.2.4, the small disparity between S and JK's MLU, and the closeness of their

results to Miller's age equivalents (1981) indicate that using the MLU protocol proposed in chapter 3 gives MLU values for Norwegian that can be compared to MLU values calculated for English utterances.

Figure 1: Sentence complexity as a function of vocabulary size for Italian and English toddlers (from Caselli, Casadio and Bates, 1997; as cited in Bates and Goodman, 1997)

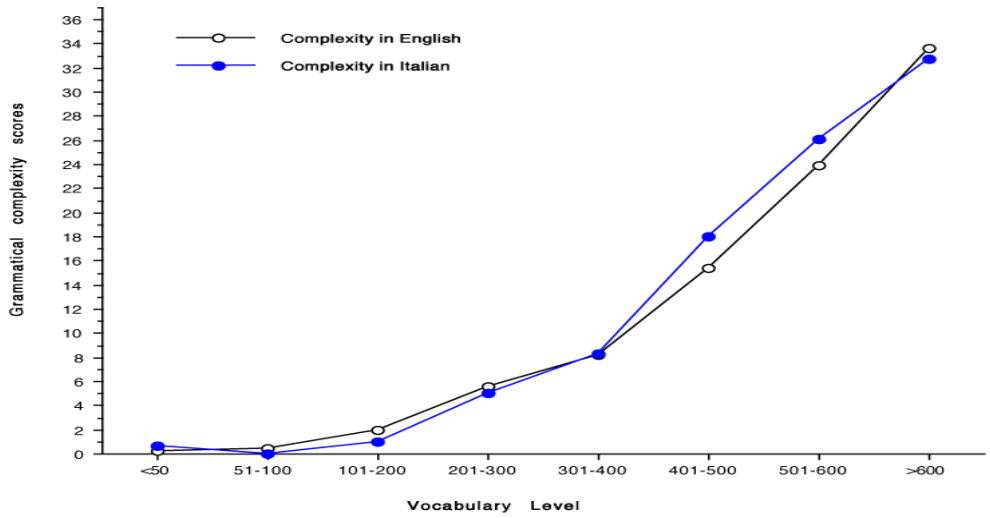


Figure 1, here reprinted for convenience, shows results from both English and Italian studies. Here, grammatical complexity is shown as a function of vocabulary level. This graph is very interesting, as it shows what grammatical complexity, and thus level of grammatical proficiency, can be expected of children with certain vocabulary sizes. It is also of interest to notice that the grammatical development follows an almost linear path from vocabulary level 301-400 to the >600 level in the English data sample (Caselli, Casadio and Bates 1997; as cited in Bates and Goodman, 1997). Up to that point, the graph is non-linear. The Italian graph, however, follows a slightly different path, where the rate of development for grammatical complexity slows down a bit between vocabulary levels 501-600 and >600. JK and S's results seem to indicate that there is a similar connection between vocabulary size and grammatical proficiency in the acquisition of Norwegian. S is reported to having obtained higher MLU values than JK, especially after month 24, when his vocabulary size is reported to having surpassed JK's. This does not mean that a graph of grammatical

complexity as a function of vocabulary size for Norwegian would look the same as the ones for Italian and American English in

Figure , as the grammatical development might e.g. be slower up to the vocabulary level 401-500.

Also worth noting that Caselli et al. (1997) and Bates and Goodman (1997) used a different tool for measuring grammatical complexity than MLU. The relationship between results obtain from MLU and the grammatical complexity measured on the CDI is as of yet not researched to any extent, so it is impossible to know how much a difference of e.g. 1 MLU would be expressed in the grammatical complexity index of the CDI. Therefore, the relatively small difference between the increase in MLU for JK and S, only 0.03, might be recorded as either being larger or smaller on the grammatical complexity scale used by Bates and Goodman (1997). But as the graph goes from about 2 to about 30 on the grammatical complexity axis between the relevant vocabulary levels, from 101-200 to 501-600, and the MLU went, for S, from 1.58 to 2.31, it would be expected that a relatively small increase in MLU would be recorded as a larger increase on the grammatical complexity scale. This is pure speculation, but it might explain why the grammatical complexity on Figure 1 seemingly increases at a greater rate between the relevant vocabulary levels than the Norwegian MLU results indicate.

When comparing S and JK's CDI and MLU results, it is important to notice that at the onset of the study, S had a higher MLU than JK, while his vocabulary was measured to be lower than JK's. This is quite surprising, as it contradicts the findings of Bates and Goodman (1997). When the children were 23 months old, JK had a larger MLU score than S, while having a vocabulary size, as measured on the CDI, that were under the Norwegian mean, as seen by her z-score of -0.570 for that month. As there is no CDI data for S that month, JK's vocabulary might have been larger than S' at that time. Also worth remembering that according to the results of Kristoffersen et al (2012), S should have a lower vocabulary and a lower grammatical proficiency across all age groups, but this is clearly not the case.

JK's MLU result for when she was 24 months old is a lot higher than S's result, as her MLU was 3.1, and his was 2.25. It is unlikely that this result is an accurate measure of her grammatical proficiency, as it is not only much larger than the other results obtained in this study, but also much larger than her 2.15 MLU score the next month. The sharp decline in JK's grammatical proficiency indicated by the difference between her MLU values, if accurate, would be very dramatic and unexpected. If the assumption that JK did not suddenly become less proficient in Norwegian grammar is correct, JK's MLU was actually somewhere between her 22 month MLU 1.86 and 25 month MLU 2.15. If this assumption is correct, S's MLU at 24 months was higher than JK's MLU, as it was calculated that S had an MLU of 2.25 at that time, which is higher than JK's MLU at 25 months of age.

Despite the issues described above, the results seem to indicate that there is a link between vocabulary size and grammatical development in Norwegian acquisition, as the child with the largest vocabulary, as measured on the CDI also had the largest MLU, and that the child with the largest increase in vocabulary also had the largest increase in MLU. But even as there seem to be a similar link between grammar and vocabulary in the acquisition of Norwegian, it is impossible to conclude if this link is as strong as the one found by Bates and Goodman (1997).

Another point that has to be made is that while the MLU results gained based on the protocol seems to be similar to Miller's results (1981), a norming study needs to be conducted in order to verify this. This would also be useful as it is logical that, as with the CDI norming study, the MLU values for Norwegian will differ from e.g. the MLU values of American English, even though the results may be very similar. This would also give an indication on whether the protocol yields stable results, as with S, or unstable results, as with JK's MLU result of 3.1 at 24 months of age. As this study only had one implausible MLU result, it does seem that the protocol is functioning properly, and can be used to acquire much-needed Norwegian MLU norms.

5. Conclusion

5.1.Conclusion

This final chapter will present the conclusion of the current study.

This study has been in the field language acquisition. In this study, acquisition data have been collected both concerning the productive vocabulary, as measured on the CDI and grammatical proficiency as measured by MLU. The data on productive vocabulary were compared to the findings of Kristoffersen et al. (2012), and the findings of Dale and Fenson (1996). To be able to accurately measure MLU, an adapted version of Johnson's protocol (2005) was proposed. The proposed MLU protocol was adjusted to be able to factor in several key morphological aspects present in the Norwegian language, but not found in the English language, such as e.g., the inflection of nouns according to gender. The MLU data were compared to Miller's age equivalents (1981), but cautiously as the age equivalents for Norwegian MLU are unknown.

Finally the CDI and MLU results were compared in order to see if the same connection between the increase in vocabulary and increase in grammatical proficiency as proposed by Bates and Goodman (1997) could also be found in acquisition data from the Norwegian language.

The results indicated that this was indeed the case, but it is hard to determine whether the connection between vocabulary as measured on the CDI, and grammatical proficiency is stronger or weaker in English than in Norwegian. As this researcher used MLU, and Bates and Goodman (1997) calculated grammatical complexity based on part 2 of their CDI form, the grammatical proficiency data were not easily comparable. S and JK's MLU results increased for the period, as did their vocabulary as measured on the CDI, but the great difference between S and JK's rates of learning new words, was only marginally reflected in the difference between their MLU scores. S was reported to having learned 413 new words, while JK only acquired 271 new words, but the difference between the increase in their respective MLUs was only 0.03, as S increased his MLU score by 0.73, and JK by 0.7.

Though JK and S increased their MLU at very similar rates, S ended up having a higher MLU than JK, while at the same time having a larger productive vocabulary. This supports the view that the current size of a child's vocabulary influences that child's current grammatical proficiency.

As the MLU results of the children were relatively similar, backed by the very small difference in their rate of development, the MLU results indicate that the adjusted MLU protocol proposed in this study is valid, and can be used to calculate Norwegian MLU values. While further testing is needed in order to confirm whether this is true or not, it is at least a steppingstone towards the goal of creating a Norwegian specific MLU protocol. Having such a protocol is valuable, as data on grammatical development could then be shared and compared within the Norwegian linguistic community, and be compared to data from e.g., American English.

5.2.Suggestion for further work

As of yet, there are little data on the grammatical development of both monolingual and bilingual children acquiring Norwegian. The adjusted protocol for calculating MLU for Norwegian proposed in this thesis seems to yield good results, but without further research it is impossible to know for sure if this is the case. Further research into this could potentially be very beneficial, if the results either showed that the protocol works, or confirmed that it did not. Either result would be beneficial, as in the first case, nothing more would have to be done to the protocol, and in the latter case might lead to the development of a working protocol.

It would be very useful to conduct a Norwegian MLU norming study, to ensure that linguists researching the acquisition of Norwegian had something to compare their MLU values to. In the case of this study e.g., it would have made it possible to determine whether the children were on, above or below the national norms for both CDI and MLU. This would have been very helpful, as it would have been easier to come to a conclusion on the relationship between vocabulary size and grammatical proficiency. It would also be valuable

to have different MLU norms for boys and girls. The Norwegian CDI mean is lower for boys than for girls (Kristoffersen et al., 2012). If this is also the case for the Norwegian MLU norms, this would be further proof that grammar and vocabulary are linked.

In addition, as a final suggestion, it would be very interesting to conduct research into the relation between the grammatical complexity calculated on the CDI, and the grammatical proficiency tracked by MLU. If a close correlation is found, this would make it possible for researchers using MLU to compare their findings with studies that use CDI, and vice versa, giving linguists a much greater data pool to draw from when conducting research into grammatical development.

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