

Microstructure in the Narrative Ability of Children with Specific Language Impairment

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i. Abstract

Narratives provide a quasi-naturalistic measure to explore the language abilities of children. The microstructural (local) level of a narrative concerns the linguistic structures (e.g. embedded clauses, conjunctions, noun phrases) used in the narrative construction. So, the microstructure provides information about a child's morphosyntactic skills. The current study is a follow-up on the research of Duinmeijer (2010). In Duinmeijer (2010), the central question was whether the differences between story generation and story retelling will have an effect on the narrative scores obtained by children with specific language impairment (SLI), since attention and memory difficulties are often reported in this population. In this study, the aim was to examine how children with specific language impairment (SLI) distinguish themselves from their typically developing peers (TD) regarding their morphosyntactic abilities in the same types of verbal narratives. A group comparison (children with SLI and TD children) and a task comparison (a story generation task and a story retelling task) were performed on multiple grammaticality (i.e. word order, realization of obligatory verb arguments, inflectional morphology of the verb and the use of determiners and prepositions) and linguistic complexity variables (i.e. utterance length (MLU/MLUL), sentence structure, transitivity of verbs and the use of past/present tense). In both tasks, children with SLI produced significantly more ungrammatical utterances compared to TD children. In the story generation task, the two groups of children can only be distinguished by MLU, MLUL and the use of present/past tense. In the story retelling task, children with SLI produced fewer complex sentence structures than TD children. In the task comparison, both groups of children produced more grammatical errors in story generation as compared to story retelling. However, the degree of complexity of the language produced varied between the two tasks: more verb transitivity was found in story generation and there were more complex sentence structures in story retelling. In conclusion, the two narrative tasks (Frog Story and Bus Story) seem to emphasize different morphosyntactic skills.

Keywords: *SLI, morphosyntax, microstructure, narratives, story generation, story retelling*

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iii. Table of Contents

1.	Introduction	7
1.1	Follow-up Study (Iris Duijnmeijer, 2010)	8
1.2	Microstructural Development of Narratives	9
1.3	Microstructure of Narratives in SLI	10
1.4	Morphosyntactic Characteristics of SLI	11
1.4.1	Morphology	11
1.4.2	Syntactic Structures	13
1.4.3	Theoretical Accounts	15
2.	Research Questions	19
3.	Method	21
3.1	Participants	21
3.1.1	Selection of Children with SLI	21
3.1.2	Selection of typically developing children	22
3.1.3	Comparison of Groups	22
3.2	Narrative Tasks	23
3.2.1	Frog Story	23
3.2.2	Renfrew Bus Story	24
3.3	Measures of Linguistic Structure	24
3.3.1	Semantic-Grammatical Analysis	25
3.3.1.1	Word Order	25
3.3.1.2	Realization of Obligatory Arguments	25
3.3.1.3	Inflectional Morphology of Verbs	25
3.3.1.4	Use of Determiners and Prepositions	26
3.3.2	Analysis of Linguistic Complexity	26
3.3.2.1	MLU	26
3.3.2.2	MLUL	26
3.3.2.3	Sentence Structure (Quoted Speech, Embedded Clauses, Compound Sentences)	26
3.3.2.4	Transitivity of Verbs	27
3.3.2.5	Tense as a Time Marker	27
3.4	Statistical Analyses	27

4.	Results	31
4.1	Story Generation	31
4.1.1	Grammaticality	31
4.1.1.1	Word Order	32
4.1.1.2	Realization of Obligatory Arguments	32
4.1.1.3	Inflectional Morphology of Verbs	33
4.1.1.4	Use of Determiners and Prepositions	34
4.1.2	Complexity	34
4.1.2.1	MLU/MLUL	35
4.1.2.2	Sentence Structure (Quoted Speech, Embedded Clauses, Compound Sentences)	35
4.1.2.3	Transitivity of Verbs	36
4.1.2.4	Tense as a Time Marker	36
4.2	Story Retelling	36
4.2.1	Grammaticality	36
4.2.1.1	Word Order	37
4.2.1.2	Realization of Obligatory Arguments	37
4.2.1.3	Inflectional Morphology of Verbs	38
4.2.1.4	Use of Determiners and Prepositions	39
4.2.2	Complexity	39
4.2.2.1	MLU/MLUL	39
4.2.2.2	Sentence Structure (Quoted Speech, Embedded Clauses, Compound Sentences)	39
4.2.2.3	Transitivity of Verbs	40
4.2.2.4	Tense as a Time Marker	40
4.3	Task Comparison	41
4.3.1	Grammaticality	41
4.3.2	Complexity	42
5.	Discussion	44
5.1	Story Generation	44
5.1.1	Grammaticality	44
5.1.2	Complexity	47
5.2	Story Retelling	48
5.2.1	Grammaticality	48
5.2.2	Complexity	49
5.3	Story Generation vs. Story Retelling	49
5.3.1	Grammaticality	49
5.3.2	Complexity	50

6.	Future Research	52
7.	Clinical Implications	53
8.	References	54
9.	Appendix	59
A	The Dutch Version of the Renfrew Bus Story (Jansonius-Schultheiss et al. 2007)	59
B	Categories of Semantic-Grammatical Analysis	60
C	Groups versus Tasks (Plots)	61

1. Introduction

Language is a very robust and complex system in which multiple knowledge domains are coordinated in communicating a message. Children with specific language impairment (SLI) have difficulty with multiple language domains (e.g. word finding, morphosyntax, and pragmatics) and the coordination of these domains.¹ SLI is a developmental disorder in which the language level observed is substantially below the nonverbal intellectual capacity (Parisse & Maillart, 2009). It is diagnosed when there is a marked impairment in the development of expressive and/or receptive language without being accompanied by factors that could influence the language development, like hearing impairment, behavioral disorders or neurological dysfunction (Bishop, North & Donlan, 1995). The prevalence of SLI is around 7% which is comparable with the frequency of dyslexia (Bishop, 2009; Shaywitz, 1998)

Thus, a child is only called specifically language impaired insofar as no specific etiology can be established (De Jong, 1999). The factors that could interfere with the language development are excluded in the diagnosis of children with SLI. This results in a heterogeneous population, because it excludes rather than includes children (De Jong, 1999). Consequently, children with very different language problems may fall into the category of SLI (Guasti, 2002).

The language characteristics of children with SLI vary considerably, from word find problems to morphosyntactic difficulties. A good method to investigate the language features of these children is to test their narrative abilities because narratives provide a quasi-naturalistic measure of children's spontaneous language, and reflect distinctive structural linguistic changes through childhood and adolescence (Reilly, Losh, Bellugi & Wulfeck, 2004). Narratives have to be organized on a macrostructural (global) level and a microstructural (local) level (Epstein & Phillips, 2009). The macrostructure refers to the overall content and organization of a narrative (Epstein & Phillips, 2009; Stein & Glenn, 1979). The microstructure concerns the internal linguistic structures (i.e. embedded clauses, conjunctions, noun phrases) used in the narrative construction (Justice et al., 2006). On this level, children have to use the appropriate morphosyntactic devices to articulate the sequence of events and their temporal relations and spatial relations (Reilly et al., 2004). So, the microstructure of a story provides information about the morphosyntactic abilities of children.

In this study, the grammaticality and complexity of the morphosyntactic narrative abilities will be investigated in children with SLI. These results will be compared with their typically developing peers. The narrative abilities are assessed with a story generation task and a story retelling task. The current study is a follow-up study on the research of Duinmeijer (2010).

¹ Specific Language Impairment is also known as 'developmental dysphasia', 'developmental language disorder' or language-learning impairment. (Parisse & Maillart, 2009).

1.1 Previous study (Duinmeijer, 2010)

The current study continues research by Duinmeijer (2010) on the narrative abilities of children with SLI compared to their typically developing peers. Duinmeijer (2010) investigated whether differences between story generation and story retelling have an effect on narrative abilities obtained by children with SLI, since attention and memory problems are often reported in this population (Duinmeijer, 2010). She used two narrative tasks to examine the narrative abilities, a story generation task (Frog Story) and a story retelling task (Renfrew Bus Story). Additionally, the children were examined on auditory attention, verbal short term memory, digit span and two independent measures of language ability (receptive vocabulary test and nonword repetition) (Duinmeijer, 2010). In the narrative tasks, the utterances were scored on plot level, story length, utterance length (MLU), linguistic complexity, fluency and grammaticality.

The results showed, firstly, that the narrative abilities of children with SLI are worse than typically developing peers. SLI children realized averagely fewer plot elements, scored lower on MLUL, uttered fewer complex sentences and produced less grammatical sentences.² Furthermore, children with SLI showed significantly more attention and verbal short-term memory deficits than normally developing children.

In addition to the differences between the two groups of children, Duinmeijer (2010) also found differences between the story generation and story retelling tasks. The narrative production of both groups of children was more grammatical and more complex in story retelling compared to story generation. Both groups obtained a higher plot score in story generation, but this difference was not significant. The children seemed to profit from the input in story retelling that contained complex, grammatical model sentences when they had to reproduce the story.

According to Duinmeijer (2010), children with SLI scored significantly lower than their typically developing peers with respect to linguistic complexity and grammaticality. However, some questions remain unanswered. For example, Duinmeijer (2010) scored errors of verb inflection, errors in word order, deletion of obligatory elements and mistakes in gender assignment all under the same denominator 'ungrammatical' (Duinmeijer, 2010). When the variety of grammatical categories is analyzed individually, this can lead to a different outcome. Additionally, the linguistic complexity and embedding clauses are also investigated on a sort of superficial level. If this variable is analyzed in more depth, this could lead to different results.

²MLU and MLUL is a measure for utterance length (see § 1.4). In Duinmeijer (2010), it is the average amount of words of the five longest utterances (MLU(5)).

1.2 Microstructural Development of Narratives

The development of children's narrative ability provides insight into the development of the different linguistic elements that are required to tell a story. Children have to coordinate phonological, lexical, morphosyntactic, and pragmatic elements into well-formed sentences to produce a cohesive narrative (Leonard, 2000). Children use significantly more simple temporal markers and more descriptives. This indicates that their narratives become more temporally cohesive and more detailed with age (Fivush & Haden, 1997). The narrative skills start developing at a relatively young age and this development continues through the whole childhood even after the age of ten (e.g. Blankenstijn & Scheper, 2003). As the children grow older, they will produce longer and more syntactically complex stories (Norbury & Bishop, 2003).

The development of the narrative ability starts around age three (Berman & Slobin, 1994) in which the stages of language acquisition can be observed. The increase of the vocabulary size accelerates (Gillis & Schaerlaekens, 2000) and the verbal output contains more complex sentences. Even though three-year-olds have considerable command of the syntax of their language, they fail to demonstrate knowledge of narrative structure (Berman & Slobin, 1994). For example, they tend to describe individual picture scenes instead of producing a thematically organized narrative (Berman & Slobin, 1994). Other evidence for this cross-linguistic observation is the way they use grammatical tense. Three-year-olds tend to shift tense based on local considerations, such as the shift from describing a static to a dynamic situation (Berman & Slobin, 1994).

Young children become more skilled storytellers around the age of five. In this age range, children are more familiar with the storytelling-setting because they are more often confronted with stories in preschool or by their parents. However, the group of five-year-olds are not homogeneous in their narrative skills. On a microstructure level, some five-year-olds use elaborate syntax and a rich lexicon, whereas others produce texts with impoverished linguistic devices (Berman & Slobin, 1994). Researchers agree that these children generally have enough knowledge of the morphosyntactic structure of their language (Reilly et al., 2004). Subsequently, the knowledge of how to use these structures in a fluent manner and to adapt these structures to the specific discourse genres continues to develop into adolescence (Reilly et al., 2004). Another characteristic of children in this age range that demonstrates their more developed abilities is the way they use tense. Around the age of five, children tend to tell a story consistently in the past or present tense (Berman & Slobin, 1994; Blankenstijn & Scheper, 2003)

When children are about nine years old, they become more skilled storytellers and their linguistic abilities become more sophisticated. Compared to the five-year-olds, nine-year-olds provide well-structured narratives. They demonstrate good command of complex syntax, which they use to describe individual events and the relationship between one event and another (Berman & Slobin, 1994). Their stories are longer and syntactically more complex (Norbury & Bishop, 2003).

However, nine-year-olds have not yet reached the level of an adult narrative. For example, they fail to consistently characterize backgrounded associated states and circumstances as distinct from foregrounded plot-advancing events (Berman & Slobin 1994; Blankenstijn & Scheper 2003).

In summary, linguistic development is reflected in the narrative ability as different components of language have to be coordinated in telling a story. Children become more skilled in outlining the hierarchical structure of a narrative (macrostructure) and in the use of more complex syntax and a richer lexicon (microstructure). However, this development becomes more aberrant when there is a disorder involved like Specific Language Impairment.

1.3 Microstructure of Narratives in SLI

The narrative development of children with SLI deviates from children with a normal development. Overall, the narratives of SLI children consist of essential ingredients of a story, organized in an appropriate sequence (Clifford, Reilly & Wulfeck, 1995). They establish and maintain the story's theme as typically developing children do (Reilly et al., 2004). Moreover, children with SLI show theory of mind. In the study of Liles (1985), children with SLI had to produce a story based on a movie. Children with SLI made more explicit reference to characters and events when they were telling a story based on the movie that had not been seen by the listener (Leonard, 2000; Liles, 1985). Furthermore, their narratives contained a significantly greater percentage of incomplete events and connections when they were telling the story to the listener who had shared the movie compared to the uninformed listener (Liles, 1985).

However, elements on a morphosyntactic and lexical level that provide a more complete and cohesive narrative are sometimes missing (Leonard, 2000). For example, SLI children use fewer words and propositions in their stories than children with a typical language development (Clifford et al., 1995; Manhardt, Hansen & Rescorla, 1995). Furthermore, children with SLI were found to produce shorter, less cohesive stories that are syntactically simpler (Liles, Duffy & Purcell, 1995; Norbury & Bishop, 2003). Their utterances contain considerably less embedding ('because) and conjunctions and they use significantly fewer connectives ('and, so, but') (Leonard, 2000). Another characteristic of narratives of SLI children is that the utterances contain frequent errors of syntax, semantics, and morphology (Norbury & Bishop, 2003) (For a more detailed overview of the morphosyntactic abilities of SLI children, see § 1.4).

The microstructural narrative abilities provide information about the way morphosyntax is used to express the events and the relations between them. To understand more about the morphosyntactic behaviour of SLI children, the next section gives an overview of their morphosyntactic characteristics reported by scientific literature.

1.4 Morphosyntactic characteristics of SLI

Children with SLI have limited language abilities (Leonard, 2000) and consequently different morphosyntactic characteristics than typically developing children. A general measure of linguistic (morphosyntactic) complexity is Mean Length of Utterance (MLU). MLU can be measured in morphemes (MLUm), syllables (MLUs) or in words (MLUw) depending on the purpose of the investigation or assessment.³ Brown (1973) introduced the MLU in morphemes which he regarded as 'an excellent simple index of grammatical impairment'. He documented that this measure in English was correlated with the development of morphological and syntactic skills in young children (Parker & Brorson, 2005). MLUm is highly correlated with age for normal children at early stages of language development (Conant, 1987; Parker & Brorson, 2005), and with age for children with SLI (Klee, Schaffer, May, Membrino & Mougey, 1989; Parker & Brorson, 2005).

Another way to measure MLU is the average number of words in utterances (MLUw). Researchers have found strong correlations between MLUm and MLUw (Hickey, 1991). Parker and Brorson (2005) have compared MLUw and MLUm and suggested that MLUw can be used as effectively as MLUm in the measurement of gross language development. In this study, MLUw and MLUL (Mean Length of Utterance of five Longest utterances) are two measurements to assess the complexity of children with SLI and their typically developing peers. Because MLU is regarded as a measure of language abilities (Leonard, 2000), the expectation is that Dutch children with SLI produce a significant lower MLUw compared to the typically developing children. Moreover, previous studies (e.g. Liles et al., 1995; Norbury & Bishop, 2003) found that children with SLI produce fewer complex sentence structures (e.g. embedding and conjunctions), which results in a shorter utterance and a lower MLU.

Although MLUw provides an image of the morphosyntactic complexity of children with SLI, it is not sufficient in describing the specific morphosyntactic features of these children. It does not give any information about the linguistic categories children with SLI have most problems with. The following section gives an overview of morphosyntactic features of children with SLI.

1.4.1 Morphology

Grammatical morphology constitutes a relative weakness in children with SLI (Leonard, 2000). Studies showed that these children often have lower use of grammatical morphology, ranging from articles (Beastrom & Rice, 1986) to the obligatory inflectional morphology of verbs (Oetting & Rice, 1997). Fletcher and Ingham (1995) listed the items that are particularly vulnerable in English-speaking children with SLI: plural *-s*, third-person singular *-s*, past tense *-ed*, auxiliary verb *be*, determiners *the/a*, infinitive particle *to*, and case marking on pronouns (De Jong, 2004).

³ For an overview of benefits and criticism of the different measures of MLU, see Leonard (2000; p. 27-30)

Obviously, some morphological difficulties are language dependent. The English language has another inflectional paradigm compared to the Dutch language for example. A paradigm is a matrix representation of a set of related morphemes that contains the dimensions of *number* and *person*, with the levels of singular and plural, and first, second and third person (Leonard, 2000). The morphological paradigm of verb inflection in Dutch and English is presented in Table 1.4.1.

Tense		Dutch	English
Present tense Singular	<i>First person</i>	-0	-0
	<i>Second person</i>	-t (-0 in inverted order)	-0
	<i>Third person</i>	-t	-s
Present tense Plural	<i>First person</i>	-e(n)	-0
	<i>Second person</i>	-e(n)	-0
	<i>Third person</i>	-e(n)	-0
Past tense	<i>Singular</i>	-te/-de	-ed
	<i>Plural</i>	-te(n)/-de(n)	-ed

Table 1.4.1. Morphological paradigm for Dutch and English (adapted from De Jong, 2004)

De Jong (1999) investigated the inflectional morphology and argument structure of Dutch children with SLI. He found three types of present tense verb errors that appear to mark morphosyntactic deficit in Dutch (De Jong, 2004). Although quantitative differences between the SLI group and the normally developing children were highly significant, all types of errors were found in both typically developing children and children with SLI. The three types of errors were:

1. Omission of inflection
Die gooi 'm in de lucht
That+one throw (unmarked verb form) him in the air
2. Misrepresentation of the number feature on the verb
dat doet altijd mijn vade [vader] en moeë [moeder]
that does (3SG) always my father and mother
3. Uninflected verb in the utterance final position
hun allemaal rommel maken
they all+sort+of rubbish make

A difference between the morphosyntactic characteristics of English and Dutch SLI children is the type of verb inflection errors. In English, inflectional errors are mostly omissions, so the utterances contain frequent unmarked verb forms they make, whereas the Dutch inflectional errors mainly concern substitutions (e.g. past tense marking by present tense) (Bedore & Leonard, 1998; De Jong, 2004).

In this study, the same types of errors are expected as were observed in previous studies. The children will probably utter more uninflected verbs and rather produce substitutions opposed to omissions.

Children with SLI do not only have difficulties with the functional morphemes regarding verbs, but also with functional morphemes that are associated with nouns. They show deficits in the production of articles (Ewijk & Avrutin, 2010). Both omission and substitution errors are reported by multiple cross-linguistic studies (Swedish: Hansson, Nettelbladt, & Leonard 2003; Spanish: Restrepo & Gutierrez-McClellan, 2001). In Dutch, definite determiners can distinguish neuter and common nouns. Common nouns are preceded by the definite determiner *de* (e.g. *de stoel*, 'the chair') and neuter nouns are combined with the definite determiner *het* (e.g. *het huis*, 'the house') (Unsworth & Hulk, 2010). Ewijk and Avrutin (2008) investigated the use of articles in Dutch children with SLI in spontaneous speech samples and they found that error of omission was the main type of error. The substitution errors that occurred were *de* for *het* substitutions which are also common in the language acquisition of typically developing children. In this study, the narratives elicit specific nouns which require the selection of specific articles. One of these narratives, Frog Story (story generation task), elicits more neuter nouns accompanied by the article *het* compared to the other narrative, Bus Story (story retelling task). Consequently, substitution errors of articles are expected to occur more often in the Frog Story compared to the Bus Story.

In summary, children with SLI have difficulties with functional morphemes. These difficulties range from the inflectional verb morphology to the use of articles. However, this is only part of the morphosyntax, so to provide a more complete image, the subsequent section outlines the syntactic characteristics of SLI children.

1.4.2 Syntactic Structures

Children with SLI show deficits in their production of sentences. These deficits occur mainly at the level of argument structure and complex sentence structures like embedding. To a lesser degree problems are found in word order (De Jong, 1999). Problems in word order are closely related to the typological properties of the native language of a child (De Jong, 1999). For example, Verb Second (V2) languages (e.g. Dutch) have the finite verb as the second element in the sentence (De Jong, 1999). Consequently, word order errors are expected to be infrequent in the present study.

Although children with SLI do not seem to have many problems with word order, they do deviate from the adult grammar in terms of sentence structures. Omissions of obligatory elements in sentences are one of the most common types of deviation (Leonard, 2000). For example, in the argument structure of verbs, arguments are sometimes omitted which results in a less complex (and possibly an ungrammatical) sentence.

This is one of the major weaknesses in children with SLI: the process of interpreting the meaning of a verb based on the sentence frame (Leonard, 2000). The meaning of the verb can be derived from the argument structure of that verb. King and Fletcher (1993) found that children with SLI sometimes omit verb arguments and consequently use transitive verbs in an intransitive frame. Even when this does not lead to ungrammaticality (in verbs like *eat*), these children show a tendency to select an intransitive frame (De Jong, 1999). However, the number of errors was relatively small because King and Fletcher (1993) observed that argument errors occurred in fewer than 3% of the verb tokens used. This percentage was not significantly different than the percentage of the MLU controls.

There is still some debate about the omission of obligatory verb arguments. Multiple studies (Lee, 1976; Rice & Bode, 1993; Van Gils, 2009) have shown that children with SLI behave comparable to typically developing peers when it comes to argument structure. Other studies (Grela & Leonard, 1997; Roberts, Rescorla & Borneman, 1994) did find significant differences between these groups of children. The conclusion of these studies is that most argument structures seem to be reflected in the speech of children with SLI, although consistency is lacking (Leonard, 2000). In other words, although they omit obligatory arguments regularly, they seem to have acquired the different types of argument structures. In this study, linguistic complexity is measured by observing the produced transitivity of verbs. Furthermore, the omissions of obligatory arguments are counted to see if SLI children do produce more errors in their argument structures. The expectation is that children with SLI omit obligatory arguments more often compared to their typically developing peers. However, their linguistic complexity in terms of verb transitivity is expected to be comparable between the two groups because previous studies have shown that for their age SLI children seem to have acquired most argument structures.

When it comes to sentence structures, several studies have found that SLI children produce fewer complex syntactic structures (e.g. embedding, conjunctions) compared to typically developing children (Marinellie, 2004). According to Marinellie (2004), typically developing children use significantly more adverbial relative clauses and coordinate clauses than children with SLI. In the present study, types of sentence structures (i.e. quoted speech, embedding, and conjunctions) are also a measure of linguistic complexity. Children with SLI are expected to produce fewer complex sentence structures.

In conclusion, SLI children show specific difficulties in their production of sentences. They tend to omit obligatory arguments and they seem to utter fewer complex sentence structures compared to their typically developing peers. Thus, children with SLI seem to cope with a wide range of morphosyntactic problems. Researchers have tried to explain the morphosyntactic difficulties of children with SLI by developing different theories, hypotheses and accounts. The theories that are the most relevant to this study will be briefly discussed in the following section.

1.4.3 Theoretical Accounts

Morphosyntax appeals to various levels of language processing (e.g. phonological, semantic) and because of the variety of language problems in SLI children, the morphosyntactic symptoms of these children are widely studied (De Jong, 2004). There are several linguistic theories that account for these deficits in morphosyntax. Broadly, these can be divided into two categories (Ewijk & Avrutin, 2010). (1) Linguistic theories claiming that some linguistic information in these children is underspecified or impaired. (2) Processing theories suggesting that the linguistic knowledge is intact, but due to reduced processing abilities, they have difficulties applying this knowledge.⁴ None of the theories can cover all of the symptoms that are found for SLI (De Jong, 1999). For this reason, theories that are the most relevant to the present study will be briefly discussed. Table 1.4.3 gives an overview of these studies together with the predicted symptoms that are expected to be observed in this study.

Linguistic theories try to explain the difficulties that arise in the production of functional (grammatical) categories (De Jong, 1999). Clahsen (1989) proposed the *Missing Agreement Account* which states that children lack the knowledge of asymmetrical relations between categories, where one category controls the other (e.g. verb inflections, auxiliaries, gender and number agreement between determiners and nouns) (Leonard, 2000; Zwitserlood, 2007). Word order within constituents and sentences tends to be correct (Clahsen, 1992). The account was originally applied to German, but also seemed to be applicable to other languages (Leonard, 2000). In this study, agreement errors are expected to be found between articles and nouns and between subjects and finite verbs. As was mentioned in § 1.4.2, word order errors would probably occur very infrequently.

Another linguistic theoretical account is the *Implicit Rule Deficit hypothesis* (Gopnik & Crago, 1991). This hypothesis claims that the problem of SLI is the inability to formulate implicit grammatical rules (Leonard, 2000). Children with SLI seem to rely on rote learning and memory (Zwitserlood, 2007). Consequently, their linguistic knowledge is not sufficient. Thus, in the present study, occasional omission of functional morphemes can be due to the absence of implicit grammatical rules.

According to the *Narrow Rule Learning account* of Ingram and colleagues (Morehead & Ingram, 1973; Ingram & Carr, 1994), the linguistic system of children with SLI does not deviate qualitatively from typically developing children. Their linguistic system develops quite similar with a marked delay in the onset and acquisition time. Once this system has developed, SLI children do not use them as creatively as typically developing children for producing highly varied utterances (Morehead & Ingram, 1973).

⁴ For a more detailed overview of the different linguistic theories that try to explain the morphosyntactic characteristics, see De Jong (1999).

In this study, SLI children are expected to be less creative and less complex in their utterances compared to typically developing children. Moreover, they would probably utter fewer complex sentence structures.

Rice, Wexler and Cleave (1995) proposed an *Extended Optional Infinitive stage* in children with SLI. While typically developing children tend to use optional infinitives (i.e. optional omission of inflectional morphology), children with SLI still produce optional infinitives at the age of 5 or 6 or even later (Guasti, 2002). Although SLI children consider finiteness as optional, they are aware of the finite-infinitive distinction (De Jong, 1999). Apparently, they do not know that tense is obligatory in main clauses (Leonard, 2000). The production of optional infinitives are also expected to be found in the present study as children with SLI between 6 and 9 year old perform the narrative tasks. Six-year-olds would probably utter more optional infinitives compared to nine-year-olds.

Some theoretical accounts have tried to explain the symptoms of SLI as a limitation in information-processing capacity (Zwitserslood, 2007). These theories emphasize the non-linguistic deficits (e.g. deficits in working memory, attention and auditory processing) that regularly accompany the linguistic problems in children with SLI.

The *Surface Hypothesis* (Leonard, 1989) assumes a general processing capacity limitation in children with SLI and claims that this limitation will have a profound effect on the perception of functional morphemes (Leonard, 2000). According to this hypothesis, functional morphemes (e.g. past tense, third person singular present, plural markers) are particularly vulnerable because of their acoustic properties (e.g. shorter duration, lack of stress) (Guasti, 2002). Consequently, the perception of these morphemes exhausts the processing resources available to these children (Guasti, 2002). This prevents the children from identifying the grammatical morphemes and placing them in a morphological paradigm (Guasti, 2002; Leonard, 2000). Although the surface hypothesis was based on English-speaking children, Dutch SLI children are also expected to omit functional morphemes more often compared to their typically developing peers. They would probably omit the tense marker in second and third person singular in present and past tense. Moreover, they are expected to omit determiners and prepositions more often.

Gathercole and Baddeley (1990) proposed that part of the problem seen in SLI is attributable to working memory deficits. For example, there is evidence that children with SLI exhibit problems in the phonological loop and in the central executive (Archibald & Gathercole, 2006). However, one should keep in mind that not all children with SLI exhibit working memory deficits as these children represent a very heterogeneous population (Montgomery, Magimairaj & Finney, 2010).⁵ In this study, working memory deficits could explain a lot of symptoms that are expected to be found. Because of memory limitations their MLU and MLUL are expected to be lower.

⁵ For an overview of the latest developments in the relation between working memory deficits and language limitations in SLI, see Montgomery et al. (2010).

Furthermore, children with SLI are expected to omit obligatory arguments, determiners, preposition more often compared to their typically developing peers. Moreover, in one of the two types of narrative tasks used in this study, story retelling task, children are obliged to use their memory when they have to reproduce a story. It is interesting to see whether these working memory deficits influence their performance on this type of task. According to Duinmeijer (2010), children with SLI appeared to express the Bus Story relatively grammatical, despite of the demonstrated problems in their executive functioning like attention and memory deficits. These children seem to profit from the auditory input when they reproduce the narrative. This input contains multiple compound sentences, embedded clauses and complex past tense forms. Consequently, there is the expectation that the grammaticality and linguistic complexity of the utterances in the Bus Story is higher than in the Frog Story,

The *procedural deficit hypothesis* of Ullman and Pierpont (2005) concerns the neurobiology of SLI. According to this hypothesis, both linguistic and nonlinguistic deficits of children with SLI can be explained by the abnormal development of the brain structures that make up the procedural memory system (Ullman & Pierpont, 2005; Zwitserlood, 2007). Moreover, part of the heterogeneity in SLI could be explained by the variation between individuals regarding which structures of the procedural memory system are affected (Zwitserlood, 2007). In this study, heterogeneous results are also expected to be found because of the heterogeneous population.

The different theoretical accounts mentioned above offer different explanations for the morphosyntactic difficulties in SLI. Most of these accounts are based on languages other than the Dutch language. It is interesting to investigate whether these accounts are consistent with the findings in Dutch data. In this study, different morphosyntactic variables will be investigated to see which morphosyntactic categories SLI children have the most problems with. Consequently, the aim is to find morphosyntactic profiles in the population of SLI children.

Furthermore, this study contributes to the present knowledge of morphosyntactic problems of children with SLI by comparing two types of narrative tasks. Narratives elicit semi-spontaneous language that reflects morphosyntactic deficits of (SLI-)children. There are two important narrative tasks that have internationally been used in many scientific and clinical settings, namely story generation task Frog Story, and story retelling task Renfrew Bus Story (Duinmeijer, 2010). Previous studies comparing story generation and story retelling tasks have not looked at the specific linguistic (morphosyntactic) differences that are elicited by the two tasks.

Moreover, this study has implications for the clinical practice as these two tasks are both used as diagnostic tests. Until the research of Duinmeijer (2010), it was not clear if these two tasks were measuring the same language abilities. Duinmeijer (2010) found a task effect between the Bus Story and the Frog Story. She suggested that these tests should be used complementary and claimed that these tasks are not interchangeable. Although it is evident that these tasks measure different language abilities, it is not clear which specific linguistic (morphosyntactic) abilities are being elicited and measured.

This leads to the research questions that center around the main question how children with SLI distinguish themselves from typically developing children regarding morphosyntactic abilities in a story generation task and a story retelling task.

	Theoretical Account	Linguistic/Non-linguistic problem	Predicted Symptoms
(1) <i>Linguistic Theories</i>	Missing Agreement Hypothesis (Clahsen, 1989)	The grammatical deficits of children with SLI are due to a selective impairment in establishing the structural relationships of agreement. Word order in general is not disturbed.	<ul style="list-style-type: none"> - Infrequent word order errors - Omission of finite marker in second and third person singular in present and past tense - Errors in determiner-noun Agreement
	Implicit Grammatical Rule Deficit Hypothesis (Gopnik & Crago, 1991)	Frequent omissions of grammatical morphemes are due to an inability to formulate implicit grammatical rules. Children with SLI rely on memory and rote learning.	<ul style="list-style-type: none"> - Inconsistent morphological marking
	Narrow Rule Learning (Ingram & Carr, 1994)	Grammatical deficits are due to a restriction in the range of contexts to which rules are applied.	<ul style="list-style-type: none"> - Simple sentence structures
	Extended Optional Infinitive Account (Rice et al., 1995)	SLI is a linguistic disorder that consists of using optional infinitives (OIs) or root infinitives (RIs) for a protracted period.	<ul style="list-style-type: none"> - Optional rather than consistent marking of finiteness
(2) <i>Processing Theories</i>	Surface Hypothesis Account (Leonard, 1989)	SLI children have difficulties with functional morphemes. The weak surface characteristics of these morphemes cause them to be neglected in input and to be omitted in output.	<ul style="list-style-type: none"> - Omission of finite marker in second and third person singular in present and past tense - Omission of determiners - Omission of prepositions
	Deficits in Working Memory (Gathercole & Baddeley, 1990)	Part of the problem seen in SLI is attributable to deficits in phonological working memory.	<ul style="list-style-type: none"> - Low MLU and MLUL - Frequent omission of obligatory object - Omission of determiners - Omission of prepositions - More grammatical errors in Bus Story compared to Frog Story
	Procedural Deficit Hypothesis (Ullman & Pierpont, 2005)	Linguistic and nonlinguistic difficulties of children with SLI can be explained by the abnormal development of brain structures responsible for the procedural memory system	<ul style="list-style-type: none"> - Heterogeneous results; a lot of individual variation

Table 1.4.3. Theoretical accounts and their explanations of the linguistic deficits in SLI (Partly adapted from De Jong, 1999). The right column shows the predicted symptoms that are expected to be found in this study.

2. Research Questions

The main question of the current thesis is:

How do children with Specific Language Impairment distinguish themselves from their typically developing peers regarding their morphosyntactic abilities in semi-spontaneous verbal narratives?

The morphosyntactic variables that are of interest in this study are grammaticality and linguistic complexity. Furthermore, there are multiple linguistic categories that can be attributed to the morphosyntax. The relevant categories for the main research question will be analyzed individually and for this reason the following sub-questions will be addressed in this study:

1. *To what extent do children with SLI differ from typically developing peers in their morphosyntactic abilities in a story generation task (Frog Story)?*
 - a. *Which morphosyntactic categories regarding the grammaticality do children with SLI and typically developing children have most problems with?*
 - *word order*
 - *realization of obligatory verb arguments*
 - *inflectional morphology of verbs*
 - *use of determiners and prepositions*
 - b. *Which morphosyntactic categories regarding the linguistic complexity do children with SLI and typically developing children have most problems with?*
 - *MLU (mean length of utterance)*
 - *MLUL (mean length of utterance of five longest sentences)*
 - *sentence structure*
(embedded clauses, compound sentences, quoted speech)
 - *transitivity of verbs*
 - *tense as time marker*
2. *To what extent do children with SLI differ from typically developing peers in their morphosyntactic abilities in a story retelling task (Renfrew Bus Story)?*
 - a. *Which morphosyntactic categories regarding the grammaticality do children with SLI and typically developing children have most problems with?*
 - *word order*
 - *realization of obligatory verb arguments*
 - *inflectional morphology of verbs*
 - *use of determiners and prepositions*

- b. Which morphosyntactic categories regarding the linguistic complexity do children with SLI and typically developing children have most problems with?
- *MLU*
 - *MLUL*
 - *sentence structure*
(*embedded clauses, compound sentences, quoted speech*)
 - *transitivity of verbs*
 - *tense as time marker*

Finally, the results of the above two questions will be compared to see if there is a task effect between the Renfrew Bus Story and the Frog Story. This leads to the following sub-question:

3. *Is there a task effect between story retelling and story generation in children with SLI and typically developing children regarding their morphosyntactic abilities?*

3. Method

3.1 Participants

In this study, the results of children with SLI are compared with the results of typically developing children. A total of 72 children (34 SLI children and 38 TD children) participated ranging from 6;1 to 9;11 years of age.

3.1.1 Selection of Children with SLI

The data of the subjects with SLI were obtained via the Speech and Language Centre (Sprak en Taal Ambulatorium) of the Koninklijke Kentalis in Eindhoven. Koninklijke Kentalis is a specialised institute which supports and provides help to children who are sensorily or communicatively disabled (Kentalis, 2010). The language-impaired children who are diagnosed and treated in the Speech and Language Center often have not reached the desired results in the therapy offered by the speech and language therapist or the diagnosis of the underlying deficit is too complex (Duinmeijer, 2010). These children receive intensive treatment for a period of three months. During this period, the children are tested and treated by an interdisciplinary team of clinical linguists, neuropsychologists, speech and language therapists and pedagogic councillors. The data of children with SLI used in this study are test scores collected at the moment of entrance (Duinmeijer, 2010). In this examination, neuropsychologists use multiple tests to test the executive functions like attention and memory. Clinical linguists use multiple language tests to examine the command of language of for example language understanding, language production, word finding and narrative abilities. Narrative abilities are tested by the Frog Story and the Renfrew Bus Story. The data of the 34 children with SLI who also participated in the study of Duinmeijer (2010) were used in this thesis for specific analyses regarding the morfosyntactic abilities.

Children who are treated in the Speech and Language Center of Koninklijke Kentalis are diagnosed as specifically language impaired, which means that their nonverbal IQ falls mostly within the normal range, they do not have severe hearing impairments and they score considerably below age norms on multiple language domains (Duinmeijer, 2010). The children who have specific phonological problems or additional deficits like autism or ADHD are excluded from this study, because in general these children show different language profiles of impairment and it is difficult to identify the cause of the different outcomes when it comes to multiple diagnoses (Duinmeijer, 2010). Other criteria were that the children had to be examined on both the Bus Story and the Frog Story task and they had to be examined with the same battery of tests for attention and memory.

Consequently, a group of 34 children with SLI ranging from 6;1 to 9;9 years participated in this study. The majority of these children lived in Eindhoven or surroundings. Seven children lived in other provinces than Noord-Brabant, namely Limburg, Gelderland or Noord-Holland. The group consists of 9 girls and 25 boys, which makes the distribution unequal. However, this distribution is representative to the gender distribution in the population of children with SLI as SLI is more likely to be seen in males than in females (Leonard, 2000).

3.1.2 Selection of Typically Developing Children

The group of controls consisted of 38 normally developing children ranging from 6;1 to 9;11 years old. The data used in this study are collected by Duinmeijer (2010). She selected the children via two public primary schools in Hoorn. Permission of parents was asked in advance and they were requested to fill out a questionnaire on the language and behavioural development of the child (Duinmeijer, 2010). The children were included in the study in case of absence of a behavioural disorder, learning disorder or language disorder (Duinmeijer, 2010). Furthermore, Dutch had to be the mother tongue of the children (Duinmeijer, 2010). However, three children did not entirely meet this criterion, but at the time of the examination Dutch was their first language and there were no delay or problems reported in this language. So, these children were included in this study.

3.1.3 Comparison of Groups

The characteristics of the two groups of subjects are outlined in Table 3.1.3. This table shows that the sample sizes and the averages of age are not quite comparable. Following the analysis of Duinmeijer, the outcome of a t-test showed a significant difference between the two age means ($t= 2.138$, $p < .05$). Moreover, the control group is on average older than the language-impaired children, when the age-matched control group is already expected to perform better than the children with SLI (Duinmeijer, 2010). For this reason, the age differences were corrected in the statistical analyses (see §3.4).

	SLI			TD		
	N	\bar{x}	(s.d.)	N	\bar{x}	(s.d.)
6 years old	14	6.39	(.239)	9	6.54	(.346)
7 years old	11	7.39	(.216)	11	7.44	(.206)
8 years old	5	8.33	(.312)	10	8.35	(.320)
9 years old	4	9.44	(.293)	8	9.47	(.356)
Total	34	7.35	(1.054)	38	7.89	(1.092)

Table 3.1.3. Overview of sample sizes, means and standard deviations of age of the group with SLI and the typically developing group in four age categories (Adapted from Duinmeijer, 2010).

3.2 Narrative Tasks

The clinical linguists at the Koninklijke Kentalis use two narrative tasks to test the performance of children on different linguistic levels, Renfrew Bus Story and the Frog Story. Until the research of Duinmeijer (2010), it was not clear if the performances on the two tasks differed significantly and if they were measuring different skills. Apparently, there are significant differences between the two tasks. In this follow-up study, the score forms of the study of Duinmeijer (2010) are used including the transcribed utterances to analyze the differences between the tasks on a morphosyntactic level. The narrative tasks that are used are also the Frog Story and Renfrew Bus Story.

3.2.1 Frog Story

In the Frog Story, children have to tell a story about a frog based on a wordless picture book with a series of 24 pictures that represent events (Berman & Slobin, 1994). The original picture book with the title *Frog, where are you* originates from 1969 and was created by Mercer Mayer. The children were presented with the picture book and were asked to tell the story to the researcher (Berman & Slobin, 1994).

The story is about a boy and his dog, and the search of their missing frog (Reilly et al., 2004). While searching for the frog, the boy and dog encounter various forest animals that interfere with their search and that eventually lead the boy and his dog to the frog (Reilly et al., 2004). In this story generation task, children have to integrate local episodic elements with the more global search theme of the story (Reilly et al., 2004). Because it contains no words, it provides a relatively rich context for language production. Furthermore, this picture book has been used extensively in cross-linguistic work (Berman & Slobin, 1994) and across typically and atypically developing populations (Reilly et al., 2004).

The performances of the children are videotaped and the utterances are transcribed and segmented afterwards. Subsequently, the utterances are scored on plot, MLU, MLUL, story length, number of utterances, embedded clauses (linguistic complexity), morphosyntactic analysis (grammaticality) and fluency. For this analysis, the Dutch instruction for transcription and analysis is used (Blankenstijn & Scheper, in progress).

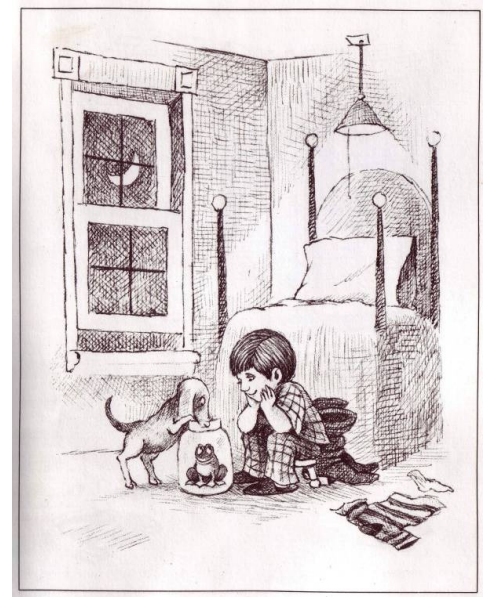


Figure 3.2.1. Picture of the Frog Story (Mayer, 1969)

3.2.2 Renfrew Bus Story

The Renfrew Bus Story is a norm-referenced test which is part of the Renfrew Language Scales (Renfrew, 1997). These language scales also consist of the Word Finding Vocabulary Test and the Action Picture Test to measure linguistic skills like word finding, expressive vocabulary and generating complex sentences (embedding).

The Bus Story examines story retelling with picture support (Pankratz, Plante, Vance & Insalaco, 2007). First, the children are told a story by the researcher while they are looking at corresponding pictures depicting some key aspects (but not all details) of the story (Botting, 2002). The child is then asked to reproduce the story while using the pictures for support.

The story is about a 'naughty' bus that flees while the bus driver is trying to repair it (Duinmeijer, 2010). On his tour, the bus encounters different characters and some experiences. Eventually, his brakes do not seem to work and he drives into a pond where the bus driver finds him. The Dutch translation provided by Jansonius, Roelofs, De Bruin & Stumpel (2007) can be found in Appendix A.



Figure 3.2.2. Bus Story (Renfrew, 1997)

The key point of the Bus Story is the assessment of the quality of the information transfer. The task is videotaped, transcribed and scored on plot, MLU, MLUL, embedded clauses (linguistic complexity), and morphosyntactic analysis (grammaticality).

3.3 Measures of Linguistic Structure

In this study, the microstructural narrative abilities are of interest (i.e. morphosyntactic skills). The morphosyntactic abilities are divided into two categories: grammaticality and complexity. These two categories provide information on different levels of the morphosyntax. The two narrative tasks elicit different sentence structures varying in complexity. Duinmeijer (2010) showed that the children with SLI perform worse than their typically developing peers on both narrative tasks. Apparently, the level of narration and the required morphosyntax is too complex for children with SLI. This is going to affect their narrative abilities and produced utterances. In this study, the morphosyntax of children with SLI and their typically developing peers were analyzed in more detail to see on what level or which categories the children have the most problems with.

3.3.1 Semantic-Grammatical Analysis

The grammaticality of the performance in the two narrative tasks was assessed on the basis of four different error types. Each variable represents another level of the morphosyntax. First, all grammatical errors were divided into different linguistic categories to see which categories are the most problematic. An overview of the different categories is provided in Appendix B. Each error was individually ascribed to a category. This was also the case if a child has more than one ungrammatical error in his utterance. Subsequently, an overall grammaticality score (MSD; morphosyntactic deviating utterances) was obtained dividing all utterances that contain at least one error by the total number of utterances. The MSD was examined on the basis of four categories: word order, argument structure, verb morphology and the use of articles and prepositions. Other errors which cannot be categorized in one of these four categories were ascribed to the category *remaining errors*. These errors were not of interest in this study, because they do not influence the morphosyntactic abilities of the children (e.g. semantic and lexical errors, like substitution of possessive pronoun, substitution of nouns, substitution of connectives).

3.3.1.1 Word Order

Errors in word order were counted as a separate category within the grammatical analysis. The expectation is that the number of errors in word order will be relatively low, because this is substantial violation in the application of morphosyntactic rules of the Dutch language. These errors were counted and compared between the two groups of children by means of statistical analyses (see § 3.4).

3.3.1.2 Realization of Obligatory Verb Arguments

Additionally, as King & Fletcher (1993) pointed out, in everyday discourse omissions of obligatory arguments are sometimes allowed depending on the context. However, the elicitation of utterances in testing is a more formal setting compared to spontaneous everyday speech. For this reason, omissions of errors were counted as errors, even when it is not judged as an error in spontaneous speech. The number of omissions of the verb, subject, object or indirect object was counted to see which syntactic part was omitted the most. Obviously, optional arguments were not counted as an omission or an error.

3.3.1.3 Inflectional Morphology of Verbs

The inflectional morphology of verbs has to be specified conforming tense and agreement. Examples of inflectional errors are deletion of the obligatory tense marker *-t* in the present tense (see Table 1.4.1) and overgeneralization in the past tense. These verb morphology errors were counted and ascribed to the inflection error categories.

3.3.1.4 Use of Determiners and Prepositions

The grammatical errors in determiners and prepositions were divided into three subcategories: omission, substitution and addition. It is a greater violation of the morphosyntactic rules to omit an obligatory category than to use it in the wrong manner. Because when a child utters the wrong determiner or preposition, the child does have the knowledge of the presence of that category. The child was not able to express the right specification.

3.3.2 Analysis of Linguistic Complexity

The two narrative tasks, Frog Story and Bus Story, have both a certain degree of complexity. They both require specific verbs, elicit different sentence structures and they have different ways to trigger linguistic complexity. Linguistic complexity was assessed in four categories: MLU, MLU5, sentence structure, transitivity of verbs and tense.

3.3.2.1 MLU

MLU is a measure of utterance length. The number of words in each expression was counted and divided by the total number of utterances. When the MLU is higher, the child can handle a more complex sentence. When the MLU is lower, the child uses probably a more simple sentence structure or the child omits obligatory words.

3.3.2.2 MLUL(5)

MLUL(5) is the average amount of words of the five longest utterances. This measure indicates if the child is able to produce longer and complex sentences.

3.3.2.3 Sentence Structure (*quoted speech, embedded clauses, compound sentences*)

The sentence structure of each utterance was registered. The dependent variables in this category of linguistic complexity are *embedding, conjunctions, and quoted speech*. These sentence structures require more complexity compared to a main sentence, because they contain two or more finite verbs. Embedded clauses are complex, because it is subordination and an addition to the main sentence. Compound sentences (e.g. John ate the pizza and the pasta) are also complex because the speaker has to remember the subject or verb of the first part of the sentence. Quoted speech (e.g. 'He said: "I have enough of it" ') requires multiple structures and two finite verbs in one sentence and it is therefore also a measure of linguistic complexity. In the most cases of quoted speech, the speaker refers to another speaker and then quotes the words of that other speaker. However, the words of the other speaker can also just be an exclamation (e.g. 'The boy yelled: Help!'). These cases were not counted as quoted speech in the sense of linguistic complexity.

3.3.2.4 Transitivity of Verbs

The complexity of a verb depends on the obligatory verb arguments that have to be uttered alongside that verb. The two narrative tasks in this study trigger specific verbs to express the events in the story. In this category, each verb in the utterances of the children was registered and the number of uttered arguments was observed. Some verbs are more transitive than others, which means that more arguments have to be expressed to satisfy the conditions of the argument structure of that verb (e.g. 'The boy walked' vs. 'The boy searched for the frog'). To measure the rate of transitivity, some sort of transitivity scale was developed which consisted of four categories rating from intransitive verbs (1 argument; least complex) to transitive verbs (2 or more arguments; most complex). Intransitive verbs can also be extended with an argument or satellite like in Example (4). This type of argument structure was ascribed to the category *intransitive verb transitive use*.

4. *de bus rijdt_{intr verb} (op de weg)*
'the bus drives (on the road)'

Furthermore, some transitive verbs can be used optionally transitive like in (5). This kind of utterance was classified to the category *transitive verb intransitive use*.

5. *de jongen roept_{tr verb} (de kikker)*
'the boy calls (for the frog)'

The scale rated from 1 argument to 2 or more arguments. This analysis will give an image of the transitivity of the verbs in each story, so it shows which narrative elicits verbs that are more complex.

3.3.2.5 Tense as a Time Marker

In this category, the time that is expressed in each utterance will be registered. The verb is used as an indicator for time, so the utterances without a verb are also registered. If a child is able to use consistently the past tense and the right morphological form, it requires the most linguistic complexity.

3.4 Statistical Analyses

The statistical analyses used in this study were based on a group comparison (SLI and TD) and a task comparison (Frog Story and Bus Story). First, the groups were compared on different grammaticality and complexity variables of each individual task. Obviously, the aim was to rule out other factors that could influence the outcomes. However, a t-test revealed that the average age between the two groups differed significantly (see § 3.1). Consequently, age could be a confounding factor that could have an influence on the dependent variables (Field, 2009). For this reason, age was included as a covariate in the comparisons between the two groups of children.

An ANCOVA (Analysis of Covariance) was performed on the overall grammaticality score (MSD) to see whether the two groups differed significantly in making grammatical errors. As was expected, the two groups differed considerably in the number of utterances that contained at least one morphosyntactic error.

For this reason, the individual grammatical categories (i.e. word order, realization of obligatory arguments, inflectional morphology of verbs and the use of determiners and prepositions) were analyzed with a MANCOVA (Multivariate Analysis of Covariance).⁶ By including all the dependent variables within such a grammatical category (for example dependent variables 'deletion of subject, object, indirect object, verb, addition of an extra argument' within category 'realization of obligatory arguments') in the analysis, a MANCOVA detects whether the groups differ along a combination of variables (Field, 2009). So, it gives an outcome of the category as a whole. One assumption of the MANCOVA is the homogeneity of covariance matrices which assumes that the variances in each group are roughly equal for each dependent variable and that the correlation between any two dependent variables is the same in all groups (Field, 2009). This assumption was checked with a Box's test that should be non-significant if the assumption was met.

If the MANCOVA was significant, subsequent ANCOVA's were carried out on all of the dependent variables within that category to see in which variable the differences exist (Field, 2009). Furthermore, if the outcome of the Box's test was significant, the outcomes of multiple ANCOVA's were more reliable than the outcome of the MANCOVA. However, the chance of finding a significant result increases considerably when multiple ANCOVA's are carried out on the same sample (Duinmeijer, 2010). For this reason, the significance level was brought down to the level of $p \leq .01$.

Additionally, the outcomes of the Levene's test were used to check if the assumption of the homogeneity of variances was tenable (Field, 2009). These outcomes needed to be non-significant to meet the assumption. However, in the case of a large sample size, small differences in group variances can produce a Levene's test that is significant (Field, 2009). Therefore, the Hartley's F_{\max} (also known as variance ratio) should be considered.⁷ The critical value of Hartley's F_{\max} for sample size 34 and 38 is about 2.5, so the assumption of homogeneity is met when variance ratio is below this value (Duinmeijer, 2010).

The same statistical methods were applied on the complexity variables (MLU, MLUL, sentence structure, transitivity of verbs and the use of present and past tense).⁸ A MANCOVA with subsequent ANCOVA's were performed to examine whether there was a group effect on the different variables.

⁶ Only an ANCOVA was performed on the category 'word order', because this category contained just one variable (word order errors).

⁷ The variance ratio is the ratio of the variances between the group with the biggest variance and the group with the smallest variance (Field, 2009).

⁸ Only an ANCOVA was performed on the category 'MLU' and MLUL', because this category contained just one variable.

In the task comparison, age was not a confounding factor, because the dependent variables of the two narrative tasks were compared within subjects instead of between subjects as in (M)ANCOVA. Repeated Measures were carried out on all the variables to see whether there was a task effect.

The measures mentioned above did not provide information about specific interactions between the two tasks and groups. Therefore, additional analyses were performed to detect interactions between the two measures (i.e. Frog Story and Bus Story) and the two groups (i.e. children with SLI and typically developing children). Repeated Measures were performed with between factor *groups* and within group factor *tasks*. Furthermore, plots were constructed to see how the two groups differed from each other with respect to the two tasks. These plots can be found in Appendix C. Table 3.4 and 3.4.1 give an overview of all categories, dependent variables and the applied statistical methods.

Grammaticality	<i>Covariate: Age</i>	
	Morphosyntactic deviating utterances (MSD)	ANCOVA
	Word order (MSD//WO)	ANCOVA
	<i>Argument structure (MSD//Obl.Arg)</i>	MANCOVA
	Deletion of verb (Del. V)	ANCOVA
	Deletion of subject (Del. S)	ANCOVA
	Deletion of object (Del. O)	ANCOVA
	Deletion of indirect object (Del. I)	ANCOVA
	Deletion of adverb (Del. Adv)	ANCOVA
	Addition of an extra argument (Add. Arg)	ANCOVA
	<i>Verb Morphology (MSD//V)</i>	MANCOVA
	Deletion of finite marker -t (Del.-t)	ANCOVA
	Congruence error (CE. pl > sing)	ANCOVA
	Congruence error (CE. sing > pl)	ANCOVA
	Morphology past tense (Morph.Past T)	ANCOVA
	Remaining verb errors (Remaining V)	ANCOVA
	<i>Determiners (MSD//Det)</i>	MANCOVA
	Deletion of determiners (Del. Det)	ANCOVA
	Substitution of determiners (Sub. Det)	ANCOVA
	<i>Prepositions (MSD//Prep)</i>	MANCOVA
	Deletion of prepositions (Del. Prep)	ANCOVA
	Substitution of prepositions (Sub. Prep)	ANCOVA
	Addition of an extra preposition (Add. Prep)	ANCOVA

Table 3.4. Linguistic categories with the dependent variables and the applied statistical methods used in the group comparison.

Complexity	<i>Covariate: Age</i>		
	Number of utterances (No. Utt.)		ANCOVA
	Number of words (No. Wrds)		ANCOVA
	Mean length of utterance (MLU)		ANCOVA
	Mean length of the five longest utterances (MLUL)		ANCOVA
	<i>Sentence structure</i>		MANCOVA
	Quoted speech		ANCOVA
	Embedding		ANCOVA
	Conjunctions		ANCOVA
	Embedding + Quoted speech		ANCOVA
	Embedding + Conjunctions		ANCOVA
	Quoted speech + Embedding + Conjunctions		ANCOVA
	<i>Transitivity of verbs</i>		MANCOVA
	Intransitive verb (Intr.)		ANCOVA
	Intransitive use of a transitive verb (Intr.use (tr .V))		ANCOVA
	Transitive use of an intransitive verb (Tr.use (intr.V))		ANCOVA
	Transitive verb (Tr.)		ANCOVA
	<i>Tense as a time marker</i>		MANCOVA
	Present Tense		ANCOVA
	Past Tense		ANCOVA
No Marker		ANCOVA	

Table 3.4 (continued). Linguistic complexity categories with the dependent variables and the applied statistical methods used in the group comparison.

Grammaticality	MSD		Repeated Measures ⁹	
	Word Order		Repeated Measures	
	Argument Structure		Repeated Measures	
	Verb Morphology		Repeated Measures	
	Use of Determiners		Repeated Measures	
	Use of Prepositions		Repeated Measures	
	Complexity	MLU		Repeated Measures
MLUL			Repeated Measures	
Sentence structures		Quoted Speech		Repeated Measures
		Embedding		Repeated Measures
		Conjunctions		Repeated Measures
Transitivity		Intr.		Repeated Measures
		Intr. use (tr.V)		Repeated Measures
		Tr. use (intr. V)		Repeated Measures
		Tr.		Repeated Measures
Tense		Present Tense		Repeated Measures
		Past Tense		Repeated Measures
		No Marker		Repeated Measures
Groups versus Tasks (2 x 2)			Repeated Measures	
Within-groups factor	Task: Frog Story & Bus Story			
Between-groups factor	Group: SLI & TD			

Table 3.4.1. Linguistic categories with the dependent variables and the applied statistical methods used in the task comparison and the groups-versus-tasks analysis.

⁹ Repeated Measures was carried out on the groups separately in the task comparison. Consequently, there was no *between-groups factor*.

4. Results

In the following section, the results are outlined of story generation and story retelling on grammaticality and complexity variables. First, there is a group comparison between the results of SLI-children and TD-children. Subsequently, the results within each group of children were compared to see what the differences are between the two tasks.

4.1 Story Generation (SG)

In the story generation task (Frog Story), the children had to produce a story on the basis of a set of pictures. The subsequent section gives an overview of the grammaticality scores and the differences between the two groups of participants.

4.1.1 Grammaticality

A morphosyntactic analysis provided insight of the frequency and types of morphosyntactic errors. In this analysis, all grammatical errors were scored by counting the errors and dividing them into different language categories. Figure 4.1.1 gives an overview of the different categories and the distribution between these categories. Both groups of children show a similar error pattern, meaning that TD children also have difficulties in the same linguistic categories as SLI children. In the SG task, SLI children made most errors in the use of determiners (deletion, substitution and addition) and subsequently with errors in argument structure and errors in verb morphology. In TD children, most errors were found in respectively verb morphology, the use of determiners and argument structure. Although the TD children show an equivalent error pattern, the number of errors differs significantly between both groups. This confirms the presence of a severe language problem in children with SLI.

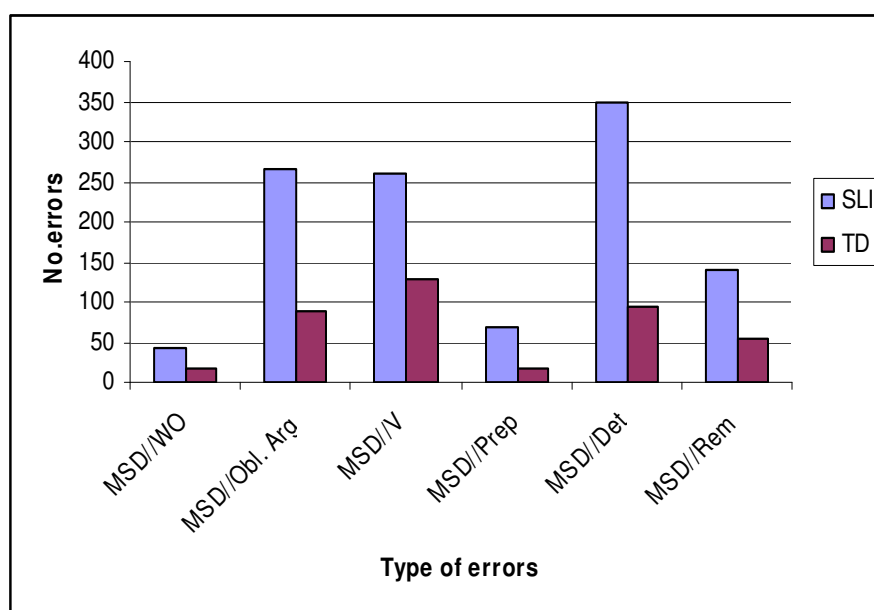


Figure 4.1.1. Overview of the different types of grammatical errors of SLI and TD children. The errors are divided in the following categories: MSD//WO (errors in word order), MSD//Obl. Arg (errors in argument structure), MSD//V (errors in verb selection and verb morphology), MSD//Prep (errors in the use of prepositions), MSD//Det (errors in the use of determiners), MSD//Rem (remaining errors)¹⁰. The y-axis displays the absolute number of errors of each group of children in the SG task.

¹⁰ Remaining errors occurred very randomly and did not influence the other categories. An example of a remaining error is the substitution of possessive pronoun (see § 3.3.1).

The differences between the two groups regarding the grammaticality score (MSD) was significant ($F(1,71)= 34.65^{**}$, $p < .01$). This fulfils the expectation that children with SLI make significantly more grammatical errors than TD children. Therefore, MANCOVA's were performed on the different categories to see which morphosyntactic categories are more problematic for the two groups of children. Subsequent ANCOVA's were then carried out to examine on which variables the groups of children differ.¹¹

4.1.1.1 Word Order

Word order problems were relatively infrequent compared to the other language categories. This was consistent with previous studies (e.g. De Jong, 1999; Clahsen, 1989) which reported that children with SLI do not make this kind of linguistic error very often. However, children with SLI made significantly more word order errors than TD children ($F(1,71)= 7.54^*$, $p < .01$).¹² So, these errors do occur more often in SLI children compared to children with a typical language development. Moreover, the distribution of errors between the different ages of the TD children showed that the 6- and 7-year-olds made more word order errors than 8- and 9-year-olds. However, the number of children in the different age groups was too small to find a significant age effect ($F(1,37)= 1.17$, $p > .05$). There was also no significant age effect in word order errors of the SLI children ($F(1,33)= 0.94$, $p > .05$).

4.1.1.2 Realization of Obligatory Arguments

SLI children made significantly more errors in realizing the argument structure of verbs ($F(1,71)= 5.125^{**}$, $p < .01$). Subsequently, ANCOVA's on the individual variables were performed. In SPSS, an option is available to estimate the marginal means in which age can be included as a covariate. Table 4.1.1.2 gives an overview of these results.

	SLI			TD			ANCOVA		ANOVA	
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
Del. V	34	2.34	0.31	38	0.80	0.29	$F(1,71)= 12.84^{**}$	.001	$F(1,71)= 14.34^{**}$	.001
Del. S	34	2.95	0.39	38	0.68	0.37	$F(1,71)= 17.24^{**}$	.000	$F(1,71)= 20.08^{**}$	.000
Del. O	34	0.79	0.16	38	0.19	0.17	$F(1,71)= 6.28$	.015	$F(1,71)= 8.19^*$	.006
Del. I	34	0.04	0.02	38	0.00	0.00	$F(1,71)= 2.52$	.117	$F(1,71)= 1.12$	.294
Del. Adv	34	1.48	0.22	38	0.75	0.21	$F(1,71)= 5.61$	.021	$F(1,71)= 5.75$	.019
Add. Arg	34	0.16	0.05	38	0.02	0.05	$F(1,71)= 4.67$	.034	$F(1,71)= 3.50$	.066

Table 4.1.1.2. An overview of the results of the ANCOVA's on the different variables: Del.V(deletion of verb), Del.S (deletion of subject), Del.O (deletion of object), Del.I (deletion of indirect object), Del.Adv (deletion of an adverb in an obligatory context), Add.Arg (addition of an extra argument).

¹¹ Although a number of Levene's tests were significant, the variance ratio's (Hartley's F_{max}) were below the critical value of 2.5. This means that the assumption of the homogeneity of variances was met.

¹² ANOVA: $F(1,71)= 9.57^{**}$, $p < .01$

A group effect was found for the variables 'deletion of verb' and 'deletion of subject'. Children with SLI omitted these obligatory elements in a sentence significantly more often than TD children. Furthermore, because the significance level was brought down to .01, the chance to find a significant effect decreased. Consequently, the variables 'deletion of an object', 'the deletion of an adverb in an obligatory context' and 'the error of adding an extra argument' did not give a significant group effect. However, these numbers still show that the frequency of argument structure errors is higher in SLI than in TD children.

4.1.1.3 Inflectional Morphology of Verbs

SLI children made significantly more errors in verb morphology ($F(1,71) = 4.447^{**}$, $p < .01$). The results of the different variables are summarised in Table 4.1.1.3.

	SLI			TD			ANCOVA		ANOVA	
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
Del. -t	34	1.80	0.30	38	0.20	0.28	$F(1,71) = 14.66^{**}$	.000	$F(1,71) = 15.45^{**}$	.000
CE. pl > sing	34	1.11	0.20	38	0.71	0.19	$F(1,71) = 2.08$	.154	$F(1,71) = 2.97$	.089
CE. sing > pl	34	0.61	0.16	38	0.17	0.15	$F(1,71) = 3.79$	.056	$F(1,71) = 5.55$	.021
Morph.Past T	34	0.71	0.36	38	1.52	0.34	$F(1,71) = 2.67$	.107	$F(1,71) = .094$	.336
Remaining V	34	1.86	0.34	38	0.60	0.32	$F(1,71) = 7.11^*$	.010	$F(1,71) = 9.41^{**}$	.003

Table 4.1.1.3. An overview of the results of the ANCOVA's on the different variables: Del.-t (deletion of suffix second person singular), CE.pl>sing (congruence error, singular instead of plural), CE.sing>pl (congruence error, plural instead of singular), Morph.Past T (overgeneralization in past tense verb morphology) and remaining V (remaining verb errors, e.g. substitution of the past participle by an infinitive).

In Dutch, the verb after the second and third person singular receives the obligatory suffix *-t* (e.g. *hij loopt*; he walks). SLI children omitted this suffix significantly more often than TD children. This result is consistent with De Jong (1999) who found the same error (see § 1.4.1). According to De Jong (1999), the stem occurrences in the second position should be considered finite. So, the children are aware of the morphosyntactic rules because the stem form has to be extracted from the infinitive. However, it is not clear how this error should be interpreted. A possible explanation is that this error was caused by limited auditory processing in which the unstressed *-t* was not restored in the lexicon properly. Another possibility is that the children consider this tense marker optionally.

The differences in congruence errors (i.e. CE. pl>sing and CE. sing>pl) were not significant. Both groups of children tend to replace a plural verb by a singular form more often (e.g. *en er kom allemaal wespen op hun af* (SLI, 8;7), *en er komen allemaal wespen op hen af*) instead of vice versa (e.g. *en dan gaan die hond eens weg* (SLI, 6;6), *en dan gaat die hond opeens weg*).

The type of error that occurred the most in TD children was overgeneralization in marking past tense. They made more errors in verb morphology of strong past tense verbs than children with SLI. Past tense forms of strong verbs are linguistically complex forms. SLI children use this complex verb form less often and therefore make fewer errors. The number of these errors decreased as the children became older, so there seemed to be an age effect in this variable. However, additional analyses between the relatively younger age group (6- and 7-year-olds) and relatively older age group (8- and 9-year-olds) did not show a significant age effect in TD children ($F(1,37) = 6.56, p > .05$) or SLI children ($F(1,33) = 0.05, p > .05$).

TD children use past tense more often compared to SLI children (see § 4.1.2.1). Because the strong verbs are relatively frequent in both narrative tasks, these verbs require more complex verb morphology. An alternative strategy to avoid the expression of a tense marker is to use the verb *ging* ('went') in combination with an infinitive (De Jong, 1999). It was expected that when the SLI children did use the past tense, they would step over to the alternative (less complex) strategy. For this reason, additional statistical analyses were carried out on the amount of *ging* + infinitive to see whether SLI children made more use of this strategy compared to TD children. However, TD children applied this strategy more often ($F(1,71) = 8.69, p < .01, \bar{x} = 2.98, \text{st.e.} = 0.45$) than children with SLI ($\bar{x} = 1.02, \text{st.e.} = 0.48$). This result is probably the consequence of the more frequent use of the past tense of TD children.

4.1.1.4 Use of Determiners and Prepositions

A significant group effect was found in the use of determiners ($F(1,71) = 10.17^{**}, p < .01$). Children with SLI omitted the determiner significantly more often ($F(1,71) = 11.70^{**}, p < .01$) compared to TD children and they made more errors in gender assignment (i.e. substitution of *de/het*) ($F(1,71) = 18.35^{**}, p < .01$).

In the use of prepositions, SLI children made significantly more errors than TD children ($F(1,71) = 8.16^{**}, p < .01$). However, the two groups of children did not differ significantly in omitting the preposition ($F(1,71) = 4.22, p = .044$) and in expressing the wrong preposition ($F(1,71) = 5.75, p = .019$). The frequency of preposition errors was relatively low. For this reason, the ANCOVA gave only a significant result when all the preposition errors are summed up.

4.1.2 Complexity

Complexity scores were collected on the basis of five different variables: MLU, MLUL, sentence structure, transitivity of verbs and the use of past and present tense.

4.1.2.1 MLU/MLUL

The utterance length of SLI and TD children differed significantly. TD children made significantly longer sentences compared to SLI children. The groups of children did not differ significantly in the average number of utterances and the average number of words. These results are displayed in Table 4.1.2.1. This indicates that TD children are more complex in generating content information at sentence level to describe a narrative event.

	SLI			TD			ANCOVA		ANOVA	
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
No. Utt.	34	45.61	2.56	38	46.58	2.41	F(1,71)= 0.74	.786	F(1,71)= 0.22	.638
No. Wrds	34	272.30	21.11	38	326.30	19.93	F(1,71)= 3.35	.072	F(1,71)= 4.74	.033
MLU	34	6.24	0.16	38	6.87	0.15	F(1,71)= 8.20**	.006	F(1,71)= 11.88**	.001
MLUL	34	10.47	0.31	38	11.90	0.29	F(1,71)= 11.35**	.001	F(1,71)= 15.18**	.000

Table 4.1.2.1. Results of ANCOVA, Levene's Test of Equality, Mean and the Standard Error of the number of utterances, the number of words, MLU (Mean Length of Utterances, in words) and MLUL (5; Mean Length of the five longest utterances).

4.1.2.2. Sentence Structure

A MANCOVA was performed on the category 'sentence structure' by including the three different variables 'quoted speech', 'embedding' and 'conjunction'. These sentence structures are more complex, because they require at least two finite verbs in the utterance. However, both groups did not differ significantly in the production of complex sentence structures ($F(1,71)= 1.54$, $p > .05$). To clarify the outcomes, separate ANCOVA's were carried out on the individual variables. These results are displayed in Table 4.1.2.2. The two groups of children did not differ significantly on the different variables of sentence structure. Although the difference between the two groups is larger in the combination of embedding combined with conjunction, the group effect is still not significant. So, SLI children seem able to produce similar complex sentence as TD children when they have to generate a story.

	SLI			TD			ANCOVA		ANOVA	
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
Quoted Speech	34	1.89	0.42	38	1.28	0.39	F(1,71)= 1.10	.298	F(1,71)= 0.73	.395
Embedding	34	1.90	0.36	38	2.69	0.34	F(1,71)= 2.53	.116	F(1,71)= 4.51	.037
Conjunctions	34	1.32	0.34	38	1.64	0.32	F(1,71)= 0.46	.498	F(1,71)= 0.31	.582
Emb.+ Quot.	34	3.79	0.56	38	3.98	0.53	F(1,71)= 0.06	.815	F(1,71)= 1.43	.236
Emb.+Conj.	34	3.22	0.49	38	4.33	0.46	F(1,71)= 2.62	.110	F(1,71)= 3.79	.056
Quot.+Emb.+Conj.	34	5.11	0.71	38	5.61	0.67	F(1,71)= 0.26	.610	F(1,71)= 0.73	.396

Table 4.1.2.2. Results of ANCOVA, Levene's Test of Equality, Mean and the Standard Error of quoted speech, embedding, conjunctions, embedding combined with quoted speech, embedding combined with conjunctions and the combination of quoted speech, embedding and conjunctions.

4.1.2.3 Transitivity of verbs

A significant group effect was found in verb transitivity ($F(1,71)= 2.77, p < .05$). Overall, more transitivity is uttered by TD children compared to the SLI children (see table 4.1.2.3). However, the groups of children differ only significantly in using a transitive verb intransitively. These verbs are optional transitives and generate utterances that are still grammatical without an object (i.e. in verbs like *roepen* ('to call') and *zoeken* ('to search for')). Children with SLI choose more often for the intransitive (and less complex) verb use to express an event.

	SLI			TD			ANCOVA	ANOVA		
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
Intr.	34	11.88	1.00	38	11.31	0.95	$F(1,71)= 0.17$	.686	$F(1,71)= 0.03$	.865
Intr.use (tr.V)	34	6.43	0.74	38	3.44	0.70	$F(1,71)= 8.45^{**}$	.005	$F(1,71)= 7.40^*$	.008
Tr.use (intr. V)	34	7.23	0.80	38	8.37	0.75	$F(1,71)= 1.05$	.309	$F(1,71)= 2.43$	.124
Tr.	34	74.46	1.26	38	76.88	1.19	$F(1,71)= 1.88$	.175	$F(1,71)= 2.64$	.108

Table 4.1.2.3. Results of ANCOVA, Levene's Test of Equality, Mean and the Standard Error of the four categories of the transitivity of verbs (intransitive verb, intransitive use of a transitive verb, transitive use of an intransitive verb, transitive verb).

4.1.2.4 Tense as a Time Marker

In the use of time in an utterance, there were three variables: 'no tense', 'present tense' and 'past tense'. SLI children used the present tense significantly more often ($F(1,71)= 9.53^{**}, p < .01$) and TD children the past tense ($F(1,71)= 12.15^{**}, p < .01$). The amount of utterances that did not contain a verb did not differ significantly between the two groups ($F(1,71)= 3.72, p > .01$). So, SLI children seem to prefer the present (less complex) temporal markers whereas at age 8 TD children start to tell a story consistently in the past tense (see § 1.2).

4.2 Story Retelling (SR)

In the story retelling task, children had to reproduce a story that they have heard from the researcher while they were using pictures for support. This task places a demand on auditory attention and verbal short term memory.

4.2.1 Grammaticality

A morphosyntactic analysis of grammaticality showed that children with SLI made the most errors in respectively argument structure and morphology. The narrative utterances of these children contained considerably less determiner errors in the story retelling task compared to the story generation task. TD children made the most errors in respectively verb morphology and argument structure.

This pattern was comparable with the SG task. An overview of the distribution of the different types of errors is provided in Figure 2.

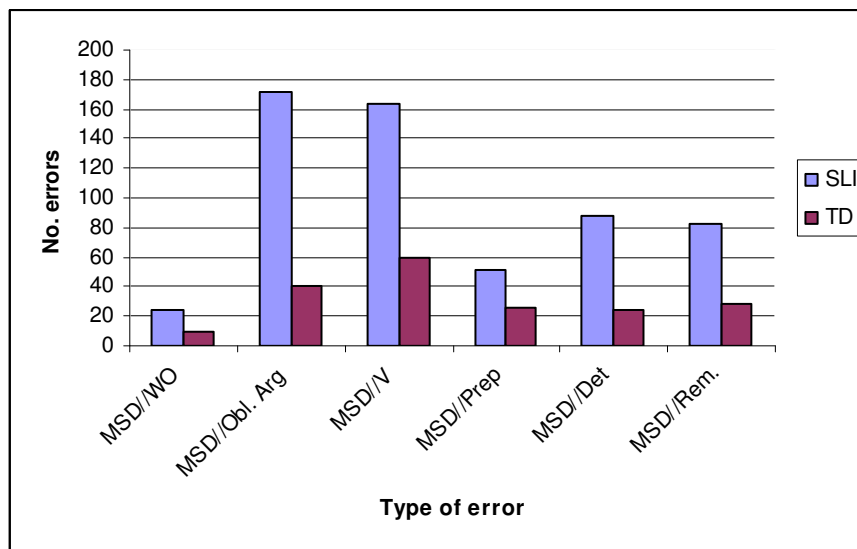


Figure 4.2.1. Overview of the different types of grammatical errors of SLI and TD children. The y-axis displays the absolute number of errors of each group of children in the SR task.

4.2.1.1 Word Order

In the SR task, word order errors were also relatively infrequent compared to the other categories. According to the significance level of 0.1, children with SLI did not make significantly more word order errors than TD children ($F(1,71) = 6.07$, $p = .016$). Also in the SR task, a possible age effect was examined. However, in TD children, the 6- and 7-year olds made not significantly more word order errors than the 8- and 9-year old children in this group ($F(1,37) = 0.91$, $p > .01$). Comparative results were found in the group of SLI children. There were no significant age effects between the age groups of SLI children ($F(1,33) = 0.70$, $p > .05$).

4.2.1.2 Realization of Obligatory Arguments

SLI children made significantly more argument structure errors ($F(1,71) = 6.512^{**}$, $p < .01$). To examine this category in more detail, subsequent ANCOVA's on the individual variables were performed. Table 4.2.1.2 gives an overview of these results. A significant group effect was found in the deletion of verbs, subjects and objects in the argument structure. So, SLI children omitted the verb, subject and obligatory object significantly more often than TD children. There were no significant differences between the groups when it comes to the deletion of an obligatory adverb in a sentence or in adding more arguments than the verb maximally requires.

	SLI			TD			ANCOVA		ANOVA	
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
Del. V	34	1.18	0.14	38	0.23	0.13	F(1,71)= 24.26**	.000	F(1,71)= 28.36**	.000
Del. S	34	1.84	0.34	38	0.30	0.32	F(1,71)= 10.65**	.002	F(1,71)= 12.72**	.001
Del. O	34	0.76	0.13	38	0.11	0.12	F(1,71)= 13.41**	.000	F(1,71)= 15.30**	.000
Del. Adv	34	1.13	0.30	38	0.44	0.29	F(1,71)= 2.63	.109	F(1,71)= 2.28	.136
Add. Arg	34	0.11	0.04	38	0.01	0.04	F(1,71)= 3.17	.079	F(1,71)= 4.93	.030

Table 4.2.1.2. An overview of the results of the ANCOVA's on the different variables: Del.V(deletion of the verb), Del.S (deletion of the subject), Del.O (deletion of the object), Del.I (deletion of the indirect object), Del.Adv (deletion of an adverb in an obligatory context), Add.Arg (addition of an extra argument).

4.2.1.3 Inflectional Morphology of Verbs

SLI children made significantly more errors in verb morphology ($F(1,71) = 3.451^*$, $p < .01$). The results of the different variables are summarised in Table 4.2.1.3. SLI children omitted significantly more often the suffix *-t* of the second or third person singular verb. So, these results are comparable with the SR task. No other significant differences were found between the two groups regarding the verb morphology. Furthermore, there is one variable in which TD children made more errors than SLI children, namely the overgeneralization in past tense morphology. It seemed that this variable is depending on age, but no age effect was found ($F(1,71) = 0.10$, $p > .05$).

Moreover, the use of *ging* ('went') + infinitive was analyzed with ANCOVA to examine whether the groups differed in applying the 'alternative' (less complex) strategy. In this task, TD children used this type of construction more often ($\bar{x} = 1.78$, $st.e. = 0.31$) than SLI children ($\bar{x} = 1.30$, $st.e. = 0.33$), but this difference was not significant ($F(1,71) = 1.06$, $p \geq .05$).

	SLI			TD			ANCOVA		ANOVA	
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
Del. -t	34	0.45	0.10	38	0.02	0.09	F(1,71)= 10.00**	.002	F(1,71)= 10.12**	.002
CE. pl > sing	34	0.16	0.05	38	0.04	0.05	F(1,71)= 2.72	.103	F(1,71)= 1.82	.182
CE. sing > pl	34	0.15	0.11	38	0.05	0.10	F(1,71)= 0.50	.482	F(1,71)= 1.09	.299
Morph. Past	34	0.64	0.18	38	0.96	0.17	F(1,71)= 1.54	.218	F(1,71)= 1.50	.255
Remaining V	34	1.63	0.36	38	0.38	0.34	F(1,71)= 6.28	.015	F(1,71)= 7.07*	.010

Table 4.2.1.3. An overview of the results of the ANCOVA's on the different variables: Del.-t (deletion of suffix second person singular), CE.pl>sing (congruence error, singular instead of plural), CE.sing>pl (congruence error, plural instead of singular), Morph.Past tense (overgeneralization in past tense verb morphology) and remaining verb errors.

4.2.1.4 The use of Determiners and Prepositions

A significant group effect was found in the amount of determiner errors ($F(1,71)= 16.68, p < .01$). The more detailed analysis on the individual variables revealed that SLI children omitted the determiners more often ($F(1,71)= 24.72^{**}, p < .01$) and that SLI children made more errors in gender assignment by choosing the wrong determiner ($F(1,71)= 19.80^{**}, p < .01$). Preposition errors were less frequent in the SG task than in the SR task, so no significant group effect was found in this category ($F(1,71)= 2.60, p > .05$).

4.2.2 Complexity

In the SR task, the children were provided with auditory input that contained model complex sentence structures, verb frames and past tense forms. The following section provides the results of the complexity variables in the SR task.

4.2.2.1 MLU/MLUL

The results of the number of utterances, number of words, MLU and MLUL were comparable with the results of the SG task and they are summarized in Table 4.2.2.1. The differences between the groups in the number of utterances and the number of words are again not significant. However, the utterances of SLI children are significantly shorter compared to the utterances of TD children.

	SLI			TD			ANCOVA		ANOVA	
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
Nr. Utt.	34	22.82	0.91	38	22.85	0.86	$F(1,71)= 0.00$	.983	$F(1,71)= 0.73$	.395
Nr. Wrds	34	144.80	6.95	38	166.80	6.56	$F(1,71)= 5.13$	.027	$F(1,71)= 9.46^*$	.003
MLU	34	6.31	0.15	38	7.30	0.15	$F(1,71)= 21.28^{**}$	.000	$F(1,71)= 27.11^{**}$	.000
MLU (5)	34	9.43	0.31	38	11.08	0.29	$F(1,71)= 14.33^{**}$	.000	$F(1,71)= 19.34^{**}$	.000

Table 4.2.2.1. Results of ANCOVA, Levene's Test of Equality, Mean and the Standard Error of the number of utterances, the number of words, MLU (Mean Length of Utterances, in words), MLUL (5; Mean Length of the five longest utterances)

4.2.2.2 Sentence Structure

A significant group effect of the complexity of the sentence structures was found ($F(1,71)= 4.79^{**}, p < .01$). The results of the individual variables are outlined in Table 4.2.2.2.

	SLI			TD			ANCOVA		ANOVA	
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
Quoted	34	0.59	0.18	38	0.63	0.17	F(1,71)= 0.02	.883	F(1,71)= 0.17	.682
Embedding	34	2.36	0.34	38	3.84	0.32	F(1,71)= 9.70**	.003	F(1,71)= 13.24**	.001
Conj.	34	0.20	0.20	38	0.85	0.19	F(1,71)= 5.44	.023	F(1,71)= 7.48*	.008
Emb.+Quot.	34	2.95	0.40	38	4.47	0.38	F(1,71)= 7.23*	.009	F(1,71)= 10.44**	.002
Emb.+Conj.	34	2.56	0.41	38	4.69	0.39	F(1,71)= 14.03**	.000	F(1,71)= 18.69**	.000
Emb.+Quot.+Conj.	34	3.15	0.48	38	5.32	0.46	F(1,71)= 10.39**	.002	F(1,71)= 14.45**	.000

Table 4.2.2.2. Results of ANCOVA, Levene's Test of Equality, Mean and the Standard Error of quoted speech, embedding, conjunctions, embedding combined with quoted speech, embedding combined with conjunctions and the combination of quoted speech, embedding and conjunctions

TD children used significantly more embedding in their sentence structures than SLI children. Because of this significant effect, every combination with embedding was also significant. The use of quoted speech and the production of conjunctions –another type of linguistically complex sentences- did not differ significantly between the two groups.

4.2.2.3 Transitivity of Verbs

SLI and TD children did not differ significantly, when it comes to the transitivity of verbs ($F(1,71)= 1.08$, $p = .364$). The analyses on the individual variables pointed in the same direction and they were neither significant. However, the distribution of the mean scores shows that there was more transitivity in the utterances of TD children than in the utterances of SLI children to retell the Bus Story.

	SLI			TD			ANCOVA		ANOVA	
	N	\bar{X}	Std. Error	N	\bar{X}	Std. Error	Group Effect	p (.01)	Group Effect	p (.01)
Intr.	34	16.82	1.57	38	15.78	1.48	F(1,71)= 0.16	.691	F(1,71)= 0.10	.752
Intr.use(tr.V)	34	2.24	0.70	38	1.12	0.66	F(1,71)= 0.59	.444	F(1,71)= 0.86	.357
Tr.use(intr. V)	34	12.06	1.39	38	14.21	1.31	F(1,71)= 2.42	.125	F(1,71)= 4.79	.032
Tr.	34	68.88	1.90	38	68.89	1.79	F(1,71)= 0.63	.432	F(1,71)= 2.35	.130

Table 4.2.2.3. Results of ANCOVA, Levene's Test of Equality, Mean and the Standard Error of the five categories of the transitivity of verbs (no verbs, intransitive verb, intransitive use of a transitive verb, transitive use of an intransitive verb, transitive verb)

4.2.2.4 Tense as a Time Marker

SLI children and TD children differed significantly in their use of the present and past tense. These results are comparable with the SG task.

SLI children used significantly more often the present tense ($F(1,71)= 21.02^{**}$, $p < .01$) and the TD children used significantly more often the past tense ($F(1,71)= 13.85^{**}$, $p < .01$) to retell the Bus Story. Furthermore, children with SLI uttered more sentences without a time marker (i.e. a finite verb) than TD children ($F(1,71)= 11.65^{**}$, $p < .01$).

4.3 Task Comparison

The scores of the two tasks (story generation and story retelling) were compared with the statistical method Repeated Measures by looking at the within-subjects factor. The narratives differ considerably in size in both groups of children, so all grammaticality and complexity scores had to be calculated to percentages. In this way, all scores were in proportion to the total amount of narrative utterances.

4.3.1 Grammaticality

In the present study, the outcomes of the different morphosyntactic categories were of interest. For this reason, Repeated Measures were performed only for the different grammaticality categories including all the individual variables instead of separate repeated measures on the individual variables. Overall, Repeated Measures on the grammaticality score (MSD) revealed that children with SLI did not make significant more grammatical errors in one of the two tasks ($F(1,33)= 0.05$, $p > 0.05$). This was also the case for TD children ($F(1,37)= 1.69$, $p > .05$). Furthermore, no significant interaction effects were found between the groups and the tasks ($F(1,71)= 0.46$, $p > 0.05$).¹³ An overview of the outcomes of the repeated measures on the different categories is outlined in Table 4.3.1.

	SLI			TD			Groups vs Tasks	
	SG/SR	Task Effect	p (.05)	SG/SR	Task Effect	p (.05)	Interaction	p (.05)
Word order	SG=SR	$F(1,33)= 0.56$	.113	SG=SR	$F(1,37)= 0.06$	.803	$F(1,71)= 0.14$	.705
Arg. Structure	SG=SR	$F(1,33)= 3.08$	.088	SG=SR	$F(1,37)= 0.22$	.642	$F(1,71)= 2.43$	.124
Verb. Morph.	SG>SR	$F(1,33)= 4.13^*$	.050	SG=SR	$F(1,37)= 0.30$	.589	$F(1,71)= 2.22$	.140
Det. Errors	SG>SR	$F(1,33)= 28.20^{**}$	.000	SG>SR	$F(1,37)= 9.61^{**}$	.004	$F(1,71)= 10.22^{**}$	.002
Prep. Errors	SG=SR	$F(1,33)= 3.50$	.070	SG>SR	$F(1,37)= 5.70^*$	.022	$F(1,71)= 0.12$	.732

Table 4.3.1. The outcomes of repeated measures on the different morphosyntactic categories: word order, argument structure, verb morphology and the use of determiners and prepositions. The differences between the tasks (SG, story generation; SR, story retelling), the F-ratio and the level of significance are displayed.

Although most morphosyntactic categories did not show significant differences between the two narrative tasks (word order and argument structure), there were categories in which a task effect was found. SLI children made more errors in verb morphology in the SG task compared to the SR tasks whereas TD children did not differ in realizing verb morphology between both tasks.

¹³ See Appendix C for graphs of all dependent variables in which the tasks versus the groups are plotted.

Also, TD children made significantly more preposition errors in the SG task compared to the SR task. Furthermore, determiner errors were much more frequent in the SG task than in the SR task in both groups of children. Additional analyses also revealed a significant interaction between the two tasks and the two groups. The decline in determiner errors of the SR task compared to the SG task is much greater for SLI children compared to the TD children (see Figure C5 in Appendix C). Apparently, the linguistic abilities regarding the use of determiners are probably more challenged by the SG task and SLI children probably have more difficulties in this linguistic category. Moreover, no other significant interaction effects were found between groups and tasks which suggest that the error pattern in the two tasks are comparable between the two groups. In other words, children with SLI made significant more grammatical errors compared to TD children, but the direction from the SG task to the SR task is mostly the same (see Appendix C). Thus, it seems that grammaticality of both groups of children is more vulnerable in the SG task compared to the SR task. The SG task seems to trigger more errors in some morphosyntactic categories than the SR task.

4.3.2 Complexity

Repeated Measures revealed that the two narrative tasks differ significantly in multiple complexity variables (see Table 4.3.2). For example, the utterances of TD children were averagely longer in SG regarding the MLU. This was also the case for the MLUL of the SLI children.

Furthermore, the three types of sentences structures occurred very differently in the two tasks. Although the production of quoted speech was comparable between the two tasks (i.e. no significant task effect), the two groups showed an opposite pattern (see Figure C9 in Appendix C). SLI children uttered more quoted speech in the SG task compared to the SR task and TD children uttered more in the SR task than in the SG task. Furthermore, embedding was the only dependent variable of the complexity categories that showed a significant interaction effect. Both groups of children produced more embedding in the SR task. However, the increase of embedded utterances in TD children was much greater compared to SLI children (see Figure C10 in Appendix C). So, TD children seem to benefit more from the auditory input than SLI children when it comes to embedding. On the other hand, SLI children uttered significant more conjunctions in the SG task whereas TD children uttered more conjunctions in the SR task (see Figure C11 in Appendix C). However, the limited number of observations of conjunctions did not result in a significant interaction effect.

Considering the transitivity of verbs, the two tasks apparently triggered different types of verbs. Overall, more intransitive verbs are uttered in the SR task and the SG task has triggered more transitive verbs. The utterances in the SG task contained more optional transitive verbs (i.e. *roepen* ('to call) and *zoeken* ('to search for')) in which the object is optional. The object was more often omitted in this task compared to the SR task. Moreover, in the SR task, there were more utterances that contained an intransitive verb combined with an object (i.e. *de bus rijdt/de bus rijdt op de weg* (the bus is driving/the bus is driving on the road)).

When it comes to time markers in the narrative utterances, both groups of children used more often the present tense in the SG task and the past tense in the SR task. The input in the SR task contained mainly past tense verbs, which apparently directs the children to use the past tense also. Furthermore, the TD children uttered more sentences without a verb in the SG tasks compared to the SR task.

Not many significant interaction effects were found which indicates a comparable pattern of linguistic complexity in both tasks between the two groups. Overall, children with SLI produce less linguistic complexity compared to TD children, but the direction of most linguistic variables from SG task to the SR task is the same (see Appendix C).

		<i>SLI</i>			<i>TD</i>			<i>Groups vs Tasks</i>	
		SG/SR	Task Effect	p (.05)	SG/SR	Task Effect	p (.05)	Interaction	p. (.05)
MLU		SG=SR	F(1,33)= 0.14	.706	SG<SR	F(1,37)= 6.77*	.013	F(1,71)= 2.03	.159
MLUL		SG>SR	F(1,33)= 14.84**	.001	SG=SR	F(1,37)= 3.89	.056	F (1,71)= 0.16	.691
Sentence Structure	Quoted	SG=SR	F(1,33)= 3.59	.067	SG=SR	F(1,37)= 0.23	.367	F (1,71)= 3.21	.077
	Emb.	SG<SR	F(1,33)= 15.59**	.000	SG<SR	F(1,37)= 57.25**	.000	F (1,71)= 6.13**	.016
	Conj.	SG>SR	F(1,33)= 7.64**	.009	SG=SR	F(1,37)= 0.37	.545	F (1,71)= 2.56	.114
Transitivity	Intr	SG<SR	F(1,33)= 2.91**	.005	SG<SR	F(1,37)= 7.19*	.011	F (1,71)= 0.38	.845
	Intr. use (tr. V)	SG>SR	F(1,33)= 9.83**	.004	SG>SR	F(1,37)= 11.49**	.002	F (1,71)= 0.26	.641
	Tr. use (intr. V)	SG<SR	F(1,33)= 10.77**	.002	SG<SR	F(1,37)= 19.93**	.000	F (1,71)= 1.50	.226
	Tr	SG>SR	F(1,33)= 4.92*	.034	SG>SR	F(1,37)= 26.09**	.000	F (1,71)= 0.64	.427
Time	Present Tense	SG>SR	F(1,33)= 18.88**	.000	SG>SR	F(1,37)= 19.63**	.000	F (1,71)= 0.02	.900
	Past Tense	SG<SR	F(1,33)= 21.22**	.000	SG<SR	F(1,37)= 22.21**	.000	F (1,71)= 0,00	.991
	No Marker	SG=SR	F(1,33)= 1.12	.297	SG>SR	F(1,37)= 5.97*	.019	F (1,71)= 1.03	.313

Table 4.3.2. The outcomes of repeated measures on the different morphosyntactic categories: word order, argument structure, verb morphology and the use of determiners and prepositions. The differences between the tasks (SG, story generation; SR, story retelling), the F-ratio and the level of significance are displayed.

5. Discussion

The main research question of the current thesis was:

How do children with Specific Language Impairment distinguish themselves from their typically developing peers regarding their morphosyntactic abilities in semi-spontaneous verbal narratives?

In answering this main question, the morphosyntactic abilities of SLI children and TD children were examined by two types of narrative tasks. In the following section, the grammaticality and complexity results of the story generation task and the story retelling task will be discussed separately. Subsequently, the results will be reviewed of the task comparison.

5.1 Story Generation

In the narrative task Frog Story, the children had to generate a story alongside a sequence of pictures. The story contained protagonists who made the story structure more complex, because the children had to refer to both of their events in time and space constantly throughout the story. This demand had consequences for the grammaticality and linguistic complexity of their narrative utterances.

5.1.1 Grammaticality

Children with SLI followed the expectation by producing significantly more ungrammatical utterances than their typically developing peers. In the SG task, SLI children seem to have the most difficulty with selecting and specifying the right determiner. The Frog Story contains a lot of neuter nouns which are accompanied by the determiner 'het'. In Dutch, the common noun accompanied by the determiner 'de' is much more frequent which causes the overgeneralization of the common determiner 'de' in neuter contexts (Orgassa & Weerman, 2008). Moreover, this story elicits a lot of diminutives which are also preceded by a 'het' determiner (Ewijk & Avrutin, 2010). Proportionally, TD children also had some difficulties in using the right determiner. Thus, determiner selection is challenged by the nouns that have to be expressed in the Frog Story. A theoretical account that could offer an explanation is the Missing Agreement Hypothesis. According to this hypothesis, SLI children have a selective impairment in establishing the structural relationships of agreement (Leonard, 2000). The lack of knowledge of the relations between categories would then cause SLI children to select the wrong determiner. Moreover, children with SLI omitted the determiner more significantly more often than TD children. This is consistent with the Surface Hypothesis (Leonard, 1989). The Surface Hypothesis claims that SLI children tend to omit functional morphemes more often because of the weak acoustic characteristics of these morphemes (Guasti, 2002). The omission of determiners would then be a consequence of the limited processing resources available to these children. Consequently, the weak surface characteristics cause them to be neglected in input and to be omitted in output (De Jong, 1999).

The second category SLI children have the most problems with in the SG task, is realizing all obligatory arguments of the verb. Analyzing the argument structure in narratives of children with SLI provide additional information because these children are then prompted to use a more complex verb argument structure than they might normally use in spontaneous speech (Zwitserslood, 2007). The hypothesis that SLI children omit significantly the subject (Example 6) and the object (Example 7) more often than their typically developing peers is confirmed.

6. **maar dan vindt \emptyset_{subj} hem nog niet* (SLI, 8;4)

*'but then finds \emptyset_{subj} him not yet'

7. **dan zie je \emptyset_{obj} niet* (SLI, 6;6)

*'then see you \emptyset_{obj} not'

This could firstly be a consequence of the transitive reading the story frequently requires. Furthermore, SLI children omitted the verb itself significantly more often. So, it seems that SLI children cannot handle a more complex argument structure that is elicited by this SG task. These results are consistent with King and Fletcher (1993) who also observed that children with SLI sometimes omit arguments and consequently use transitive verbs in an intransitive frame. Zwitserslood (2007) also found subject and object omissions in utterances of children with SLI in narrative tasks. He observed that the proportions of subject omissions and object omissions decreased from age 7 to age 8.

The omission of obligatory argument could be due to deficits in working memory (Gathercole & Baddeley, 1990). Because of these poor working memory skills, children with SLI cannot sufficiently retain what they already said in their working memory (Zwitserslood, 2007). Consequently, obligatory subjects and objects are omitted more often. However, one should keep in mind that not all children with SLI exhibit working memory problems. So, this theoretical approach cannot solely account for this type of grammatical errors.

In the SG task, both SLI children and TD children show difficulties in applying the rules of verb morphology. In verb morphology, the conditions of tense and agreement have to be fulfilled. The grammatical errors in verb morphology are related to the time that is expressed (present/past). Children with SLI used significantly more often the present tense and consequently their chance of omitting the obligatory suffix *-t* of the present tense is higher compared to TD children. This omission can be explained by the Surface Hypothesis which states that children with SLI have more difficulties with non-salient inflectional morphemes (Leonard, 1989). Consequently, in Dutch, it predicts problems with the non-syllabic *-t* (De Jong, 1999). So, the results in the present study are consistent with this hypothesis. However, the Missing Agreement Hypothesis can also account for the omission of the finite marker (Clahsen, 1989). By omitting the finite marker in second and third person in the present tense, grammatical rules of agreement are violated. In this situation, only the bare stem is produced which lacks agreement with the subject.

Another theoretical account that could explain this observation is the Implicit Rule Deficit Hypothesis (Gopnik & Crago, 1991). According to this hypothesis, children with SLI are not able to formulate implicit grammatical rules. They rely on memory and rote learning and this results in inconsistent morphological marking (De Jong, 1999; Zwitserlood, 2007). Consequently, the finite marker in the second and third person is sometimes omitted. Other errors in verb morphology are congruence errors. Both groups of children tend to replace a plural verb by a singular form more often instead of vice versa. In this way, only a stem form without inflection is uttered instead of an infinitive. This finding is consistent with the hypotheses mentioned above. However, the Surface Hypothesis cannot account for the congruence error in which a singular verb form is substituted by an infinitive. That observation could be explained by the Extended Optional Infinitive Account which claims that SLI is a linguistic disorder that consists of using optional infinitives for a protracted period (Guasti, 2002).

Furthermore, the most occurring error in TD children was overgeneralization of the past tense. They used significantly more often the past tense which requires more complex verb morphology in combination with the high frequency of strong verbs. Apparently, TD children have knowledge of the morphosyntactic rules of the past tense and they try to apply these rules, but this often appears in the form of overgeneralization. Moreover, the distribution of the overgeneralization errors displayed a maturation effect. However, because of the low number of observations, the statistical analyses did not give a significant result.

Word order problems were very infrequent in the narrative utterances of both groups of children which indicate that both groups are mostly aware of how to place the sentence elements in right order. The most frequent type of word order error concerns the inversion of the subject and the finite verb in utterances that start with an adverb. Dutch is a verb second language which means that the verb is always the second element of that sentence. The utterances of both SLI and TD children sometimes lack this inversion like in Example 8.

8. **en toen*_{adverb} *hij*_{subj} *zat*_{verb} *nog vast in die pot* (SLI, 7;3)
*en toen*_{adverb} *zat*_{verb} *hij*_{subj} (subject-verb-inversion) *nog vast in die pot*
 *'and then_{adverb} he_{subj} was_{verb} still stuck in that jar'

The infrequent occurrences of word order errors are predicted by the Missing Agreement Hypothesis. Grammatical deficits mainly occur on phrase, clause or word level and word order is in general not disturbed. These results are consistent with found results of De Jong (1999).

In conclusion, the morphosyntactic errors of children with SLI in the SG task show that SLI children have difficulties with functional morphemes and the application of syntactic rules when they have to generate a story on their own.

5.1.2 Complexity

Generating a story on the basis of a number of sequenced pictures causes the children to make their own decisions about the level of linguistic complexity. Previous studies showed different results regarding the linguistic complexity in SLI children. Some researchers claimed that children with SLI utter fewer arguments and simpler sentence structures, other researches did not find differences in linguistic complexity between SLI and TD children.

In this study, children with SLI made significantly shorter utterances indicating that their sentence structures are less complex. However, this is not reflected in their use of complex sentence structures (quoted speech, embedding and compound sentences). TD children produced averagely more complex sentence structures (except for quoted speech) than SLI children, but this difference was not significant. These results contradict the findings of other studies (e.g. Mariellie, 2005). The results of the current study indicate that children with SLI are capable of using complex sentence structures that are comparable with the sentence structures of TD children. However, the utterances of SLI children are shorter because they omit obligatory linguistic elements more often (arguments, adverbs, determiners, prepositions). Moreover, these findings are not consistent with the expectation based on the Narrow Rule Learning Account (Ingram & Carr, 1994). According to this account, children with SLI do not have a qualitatively different linguistic system compared to children. Because of a delay, SLI children are not able to use their system as creatively as TD children (Morehead & Ingram, 1973). In this study, they were expected to produce simpler sentence structures compared to TD children, but this was not the case. Multiple explanations could be offered to explain this finding. Firstly, in the age range between six and nine, SLI children could have a linguistic system that is able to produce the same type of complex sentence structures compared to TD children. Only their grammatical deficits cause their linguistic abilities to deviate from TD children. Another explanation could be that this specific type of narrative elicits the same degree of linguistic complexity in SLI children as in TD children.

The measure of the transitivity of verbs is also an indicator for linguistic complexity. In the SG task, the amount of transitivity in utterances was comparable between the two groups of children. The only dependent variable that showed a significant group effect was the use of optional transitive verbs. The narrative utterances of SLI children contained significantly more transitive verbs in which the direct object was optional compared to the narrative utterances of TD children. This means that SLI children tend to use a transitive verbs intransitively more often than TD children. This result is also consistent with findings of King and Fletcher (1993). Overall, although most variables did not reveal a significant group effect, children with SLI uttered less transitivity compared to their TD peers. Possible explanations for these findings are the same as those mentioned above regarding complex sentence structures.

5.2 Story Retelling

In the SR task Bus Story, children had to reproduce a story while they were using pictures for support. They were provided with auditory input in addition to the visual cues (the pictures). The auditory input contained complex sentence structures, like embedding, compound sentences and quoted speech.

5.2.1 Grammaticality

The morphosyntactic category in which the children with SLI made the most errors was argument structure. The children omitted the subject and the direct object more often and they omitted the verb much more often than TD children. The ungrammaticality could be due to the offered complexity in the auditory input. In this way, the children try to measure up to this complexity and consequently they leave out arguments because the required morphosyntax is too complex. These errors in argument structure are the same as those in the SG task and could be explained by poor working memory skills (Gathercole & Baddeley, 1990).

Verb morphology is the second morphosyntactic category which SLI children had most problems with. The number and types of errors resemble the error pattern in the SG task. SLI children used the present tense more often in retelling whereas TD children used the past tense more often. Consequently, the utterances of TD children contain significantly more overgeneralization of past tense verbs. These results are consistent with De Jong (1999) who also found more overgeneralization in the utterances of TD children compared to SLI children. Especially, because of the past tense in the auditory input, both SLI and TD children are more encouraged to use the past tense as well.

Determiner errors are less frequent in the narratives of SLI and TD children. The Bus Story contains more common nouns and the children are less tempted to use diminutives. However, children with SLI still omit determiners more often and they substitute the determiner '*he*' by the common determiner '*de*' more often compared to their TD peers. So, these findings are also consistent with the Surface Hypothesis and the Missing Agreement Hypothesis (see §5.1.1).

Word order errors are also infrequent in the SR task. The type of word order errors (no inversion of subject and verb that are preceded by an adverb) resemble the type in the SG task. SLI children made more word order errors than TD children, but the types of word order errors are comparable. This means that SLI children are aware of the language dependent word order rules and that they do not utter the words in a random order.

5.2.2 Complexity

The benefit of auditory input is being provided with exemplary complex and grammatical sentences. In the SR task, the utterances of SLI children were significantly shorter compared to the TD children. However, whereas in SG SLI children and TD children uttered comparable sentence structures, in SR the utterances of TD children contain significantly more embedding and compound sentences. Thus, it seems that especially TD children without attentional and verbal memory problems benefit from the auditory input.

Furthermore, there were no differences in the use of verb transitivity between SLI and TD children. This could be a consequence of the auditory input which contains complete verb frames. Both groups could profit from the provided verbs with the complete argument structures. It could be an indicator of the measure of linguistic complexity of both groups of children. So, perhaps children with SLI can express comparative complex argument structures, but it is at the cost of the grammaticality in their narrative utterances.

In summary, the narratives of SLI children contain less linguistic complexity compared to TD children. However, not all complexity variables are significantly different. This indicates that SLI children have knowledge of the morphosyntactic rules regarding the linguistic complexity. Overall, it seems that a higher demand on the linguistic complexity influences the grammaticality.

5.3 Story Generation vs. Story Retelling

The main differences between the two narrative tasks are the story structures and the instructions beforehand. The plotline of the Frog Story consists of two main protagonists which often need a transitive reading. The story also consists of more neuter nouns that are relatively infrequent in the Dutch language. The plotline of the Bus Story contains one main protagonist and more common nouns. However, the auditory input of the Bus Story provides complex adult sentence structures which encourage children to make their narratives more complex. In the Frog Story, children have to generate their own story without the help of auditory input.

5.3.1 Grammaticality

According to Duinmeijer (2010), the pooled data of both groups of children made more grammatical errors in SG compared to SR. In this follow-up study, a closer look at the different variables reveals that the overall grammaticality score is not significant in both SLI and TD children. Thus, overall, both narrative tasks seem to measure the grammaticality in similar ways. However, remarkable differences are observed between the two tasks when the different linguistic categories are compared.

First, children with SLI show greater task effects in all linguistic categories compared to the TD children. This suggests that these children are influenced by the type of task and/or the structure of the narrative. Moreover, working memory deficits that are reported in children with SLI (Gathercole & Baddeley, 1990) could interfere more in the SR task than in the SG task. In the SR task, children had to store and retrieve the most relevant information about the story from their working memory. Thus, the SR task demands more from children's working memory than the SG task.

The linguistic categories that are significantly different between the two tasks are *verb morphology*, *determiner errors* and *preposition errors*. The greatest task effect is found in the amount of determiner errors. Both SLI children as TD children make much more determiner errors in the SG task than in the SR task. These errors are probably due the high frequent neuter nouns and diminutives that have to be expressed in the Frog Story (see § 5.1.1).

Furthermore, SLI children make significantly more errors in verb morphology in the SG task compared to the SR task. Evidently, they benefit from the auditory input that contains the right morphological inflections conforming tense and agreement. So, although working memory deficits are reported in children with SLI, they do seem to benefit from the auditory input. TD children do not show a significant task effect in their verb morphology, but they do make more preposition errors in generating a story.

5.3.2 Complexity

The results of this study indicate that there is a considerable difference in the elicited linguistic complexity in the two narrative tasks. The different complexity variables give results in different directions. Significant task effects are found in utterance length (MLU, MLUL), sentence structure, transitivity and tense marking.

The utterance length is significantly different between the two tasks in both groups. Whereas TD children make significantly longer utterances in SR (MLU), the five longest utterances of SLI children are longer in SG (MLUL). These results are probably connected to the differences observed in sentence structures. Both groups of children uttered more sentences with embedding in SR compared to SG. On the other hand, SLI children produced more compound sentences in SG than in SR. Apparently, the conjunctions causes the SLI children to have a larger MLUL in SG and the number of embedding of TD children resulted in a higher MLU in SR. Moreover, it seems that both groups of children benefit from the auditory input, when it comes to producing embedded sentences. A significant interaction effect suggested that TD children benefit more from auditory input than SLI children because the number of embedded sentences increased more in the utterances of TD children compared to the utterances of SLI children. This finding could reflect poor working memory skills that are reported in SLI children (Gathercole & Baddeley, 1990).

Furthermore, the two tasks differ considerably in verb transitivity. In the SR task, both groups seem to produce more intransitive verbs whereas SG seems to elicit more transitive verbs. However, the optionality of arguments does not follow the transitivity scale. Transitive verbs are more often used intransitively in SG and intransitive verbs are more often used transitively in SR. So, this does not suggest that SG always require a transitive reading. These results are probably due to the fact that the Frog Story elicit more optional transitive verbs (e.g. to call, to search for). Thus, both TD and SLI children produce more transitive verbs and consequently more complex verb frames in SG compared to SR.

Finally, the type of narrative task influences the marking of time (past/present) in the utterances. Both groups of children use significantly more often the present tense in SG and significantly more often the past tense in SR. Because of the more complex and irregular past tense forms, these types of utterances are more complex. Thus, both SLI and TD children seem be influenced by the auditory input and they are consequently encouraged to use the more complex past tense forms in retelling the Bus Story.

In conclusion, the two narrative tasks seem to elicit morphosyntactic complexity at different levels. SG requires more verb transitivity whereas the narratives in the SR task contain more complex sentence structures (except for compound sentences in SLI) and past tense verb forms. Moreover, SR seems to elicit more grammatical utterances. Apparently, both groups of children benefit considerably by the auditory input in SR.

6. Future Research

In this study, two types of narrative tasks are used to examine the differences between story generation and story retelling. The fact that multiple aspects of these tasks differ considerably should be taken into account. Both stories have different story structures and different instructions beforehand, so more factors play a role in the comparison. The most ideal condition would be a generation task and a retelling task with comparable plot line structure.

Furthermore, children tend to use the past tense more often in the retelling task. This observation is probably caused by the offered past tense verbs in the auditory input. Consequently, TD children use more often the past tense and cease to overgeneralize strong finite verbs in the past tense. Thus, they produce more grammatical errors in the past tense morphology compared to SLI children which does not fulfil the expectations. In future research, it would be interesting to elicit only past tense verbs in both groups to examine how much complexity the children are able to express in the past tense and if SLI children tend to use the 'ging + infinitive' more often.

In the current study, children with SLI are compared with an age-matched control group of typically developing children. However, SLI research often uses two matching control groups (age-matched and language-matched) to compare the results of the SLI children with. The reason for a control group of the same chronological age is to see how and to what extent the SLI group behave differently than normally developing children of the same age. However, age matching has certain limitations (Leonard, 2000). For example, in a study in which two sets of features of language are compared to see which set is more problematic for children with SLI, any difference that is observed could mean that children with SLI have more problems with that particular feature, or that in normal language development one set is acquired before the other (Leonard, 2000). If the chronological age controls have comparable results on both sets, it is not clear which conclusion can be drawn. For this reason, researchers often use a younger group of normally developing children who are matched with the children with SLI on some measure of language ability (Leonard, 2000). This measure is often the Mean Length of Utterance (MLU) (see § 1.4).

These age limitations were also visible in the current study. It looked like there was an age effect in some variables, like word order errors and overgeneralization of strong past tense verbs. However, because the relatively low number of children in the different age groups, the statistical analysis did not result in a significant effect. Consequently, it is not clear if the SLI children have problems with the concerned variables or if that feature has not been required yet. However, because of time limitations, data of language-matched control groups could not have been collected. It would be interesting to examine possible age effects in future research.

7. Clinical Implications

When morphosyntactic abilities of children with SLI are assessed with narrative tasks, the type of narrative task should be considered carefully. In SG, the story structure of the Frog Story seems to elicit more complex noun and verb phrases, because of the higher frequency of neuter nouns and more transitive events that elicit transitive verbs. Consequently, these utterances contain more grammatical errors. In SR, SLI children produce more linguistic complexity when it comes to more complex sentence structures and past tense verbs. They seem to profit from the auditory input in story retelling tasks. Overall, it is clear that one task should not be used over the other one because it is obvious that these types of narrative tasks (Frog Story and Bus Story) emphasize different morphosyntactic skills. Both tasks should be used complementary in performing diagnostics (Duinmeijer, 2010).

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A. The Dutch Version of the Renfrew Bus Story (Jansonius-Schultheiss et al. 2007)

1. Er was op een dag een heel ondeugende bus.
Op een dag wilde de buschauffeur met zijn bus gaan rijden.
Maar die was *kapot*.
Dus moest de buschauffeur zijn bus eerst re pa re ren.
En terwijl die buschauffeur daarmee bezig was, besloot zijn bus der *vandoor* te gaan!
Hij *schoot* over de weg.
2. Eerst reed hij naast een trein.
Ze trokken gekke bekken naar elkaar en deden wie het hardste kon rijden.
Toen moest de bus alleen verder, omdat de trein een tunnel in tufte.
De bus reed snel de stad in, waar hij een politieagent tegenkwam, die op zijn fluitje blies en schreeuwde: *Stop bus!*
Maar de ondeugende bus trok zich daar *niets* van aan.
3. Hij scheurde de stad uit, het veld in.
Hij zei: Ik heb er genoeg van om op de weg te rijden.
Dus sprong hij over een hek.
Hij kwam in een weiland terecht, waar een koe stond.
Boe loeide de koe: Ik kan mijn *ogen niet geloven*.
4. De bus racete gewoon verder naar beneden, de heuvel af.
Opeens zag hij onder aan de heuvel een meertje.
En hij probeerde meteen te remmen.
Maar *Oh!* Hij wist niet hoe zijn remmen werkten.
Dus viel hij met een *Plons!* in het water en bleef in de modder steken.
Ein de lijk vond de buschauffeur zijn bus terug en belde een takelwagen om de bus uit de modder te trekken.
En de takelwagen zette de bus weer op de weg terug.
De buschauffeur was reuze blij zijn bus weer te zien.
En de bus **beloofde** dat hij er *nooit* meer *alleen* vandoor zou gaan.

B. Categories of Semantic-Grammatical Analysis

Type of error	Linguistic Categories
Deletion	verb, subject, object, indirect object, adverb, determiner, preposition, obligatory suffix of an adjective, noun, suffix in second or third person singular, demonstrative pronoun, connectives, possessive pronoun, part of the verb <i>te</i> , reflexive pronoun, plural, auxiliary
Substitution	verb, adverb, determiner, preposition, noun, demonstrative pronoun, connectives, possessive pronoun, plural, auxiliary
Addition	verb, adverb, preposition, obligatory suffix of an adjective, inflection, possessive pronoun, argument, reflexive pronoun
Word order	word order
Congruence	singular verb form instead of plural, plural verb instead of singular
Morphology	past tense, present tense, past participle, plural nouns
Tense	tense switch, the adverb <i>toen</i> with a present tense finite verb, the adverb <i>dan</i> with a past tense finite verb

Table B. The types of errors in combination with the linguistic categories that are used in the semantic-grammatical analysis.

C. Groups versus Tasks (Plots)

In the following section, figures show the proportion of the two groups of children with respect to the two narrative tasks. Each graph displays the estimated marginal means of the grammaticality variables (word order, argument structure, verb morphology, determiners, prepositions) and the complexity variables (MLU, MLUL, quoted speech, embedding, conjunctions, use of intransitive verbs, intransitive use of transitive verbs, transitive use of intransitive verbs, transitive verbs, use of past tense, use of present tense, no marker). The green line represents the group of SLI children and the blue line represents the TD groups of children. On the x-axis, 1 represents the story generation task Frog Story and 2 represents the story retelling task Bus Story. On the y-axis, the estimated marginal means are represented in percentages.

C1. Grammatical errors (MSD)

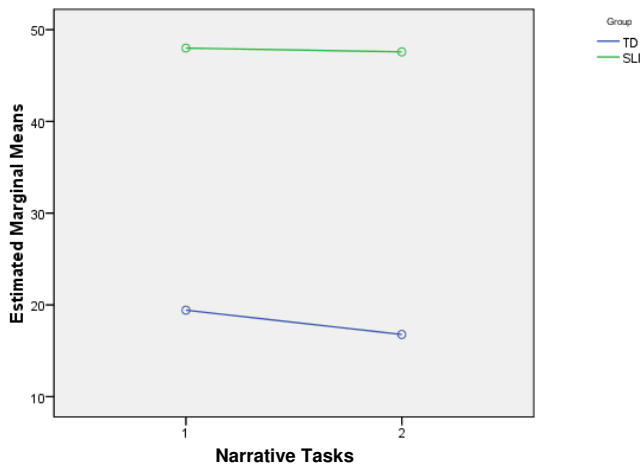


Figure C1. Estimated marginal means in percentages of the total number of grammatical errors (MSD) in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C2. Word Order

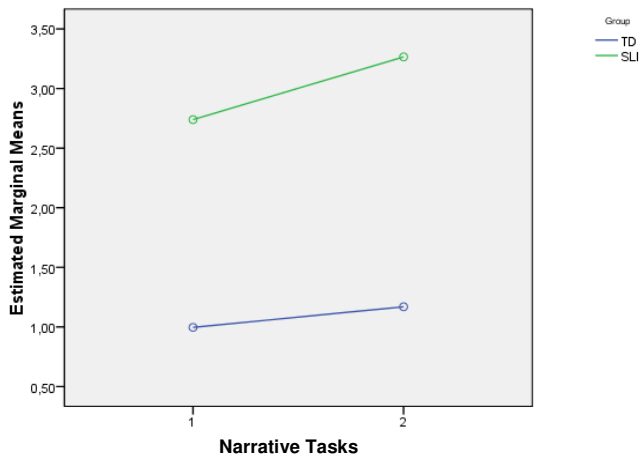


Figure C2. Estimated marginal means in percentages of the total number of utterances including a word order error in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C3. Realization of Obligatory Arguments

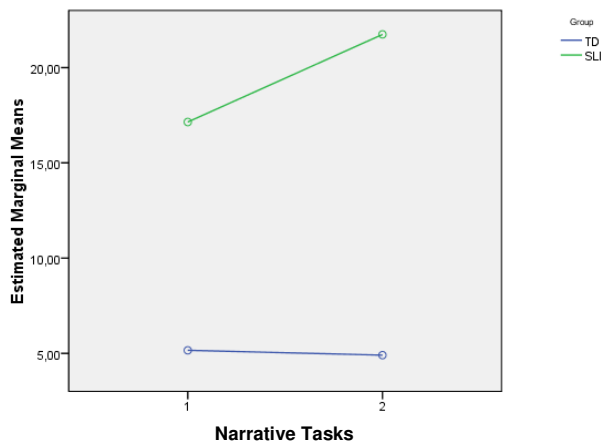


Figure C3. Estimated marginal means in percentages of the total number of utterances including an argument structure error in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C4. Inflectional Morphology of Verbs

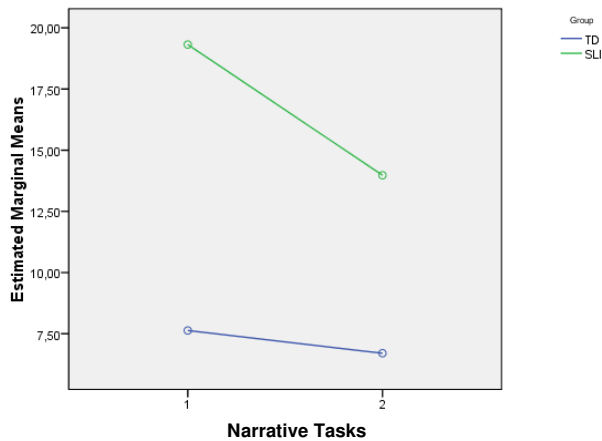


Figure C4. Estimated marginal means in percentages of the total number of utterances including an error in verb morphology in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C5. Determiners

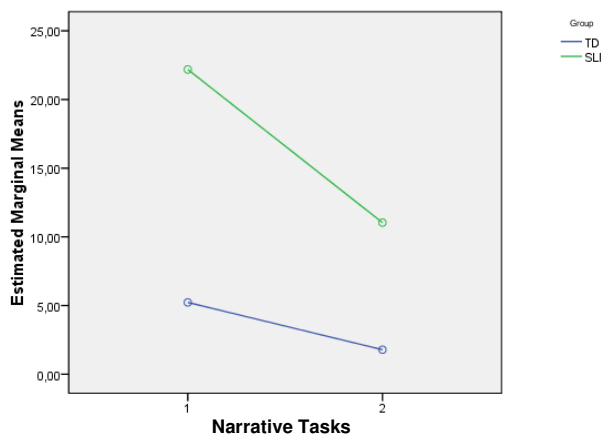


Figure C5. Estimated marginal means in percentages of the total number of utterances including determiner errors in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C6. Prepositions

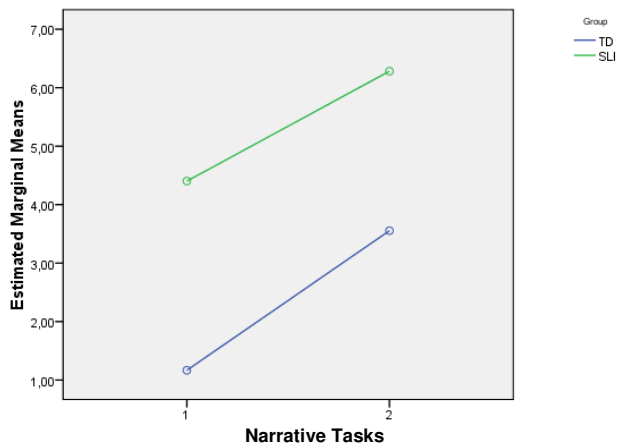


Figure C6. Estimated marginal means in percentages of the total number of utterances including a preposition error in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C7. MLU

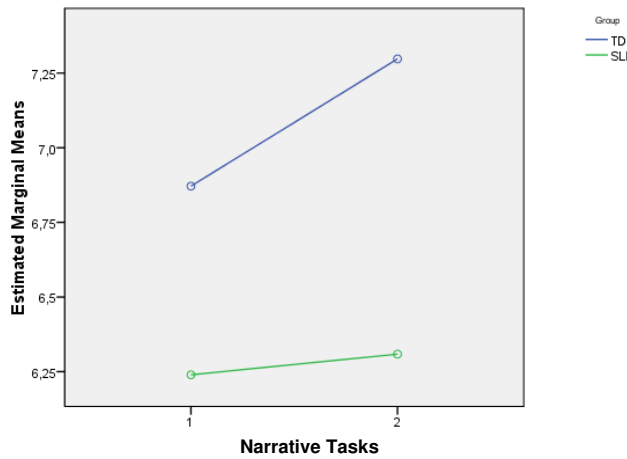


Figure C7. Estimated marginal means in percentages of MLU in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C8. MLUL

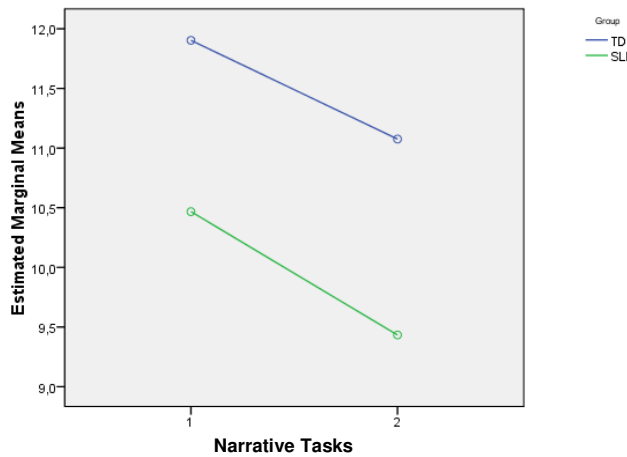


Figure C8. Estimated marginal means in percentages of MLUL in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C9. Quoted Speech

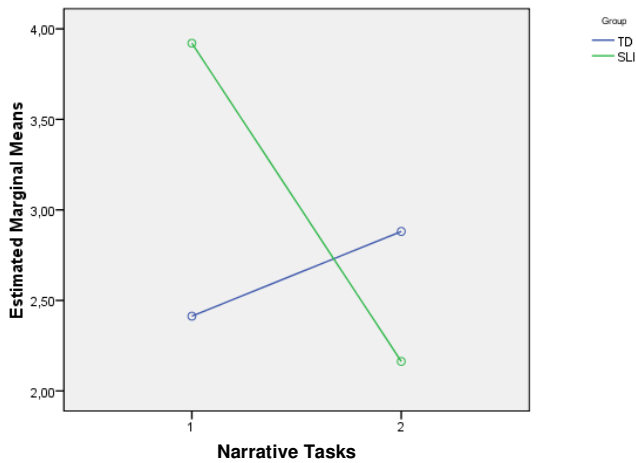


Figure C9. Estimated marginal means in percentages of quoted speech in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C10. Embedding

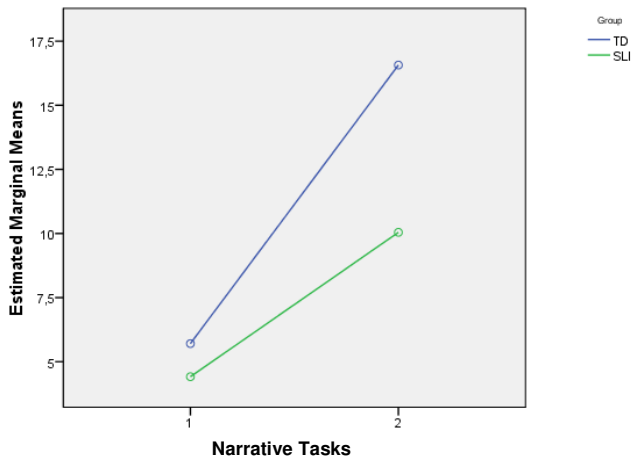


Figure C10. Estimated marginal means in percentages of embedding in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C11. Conjunctions

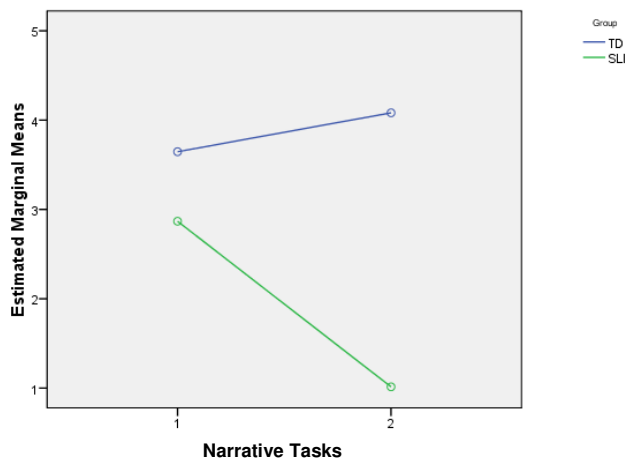


Figure C11. Estimated marginal means in percentages of conjunctions in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C12. Use of Intransitive Verbs

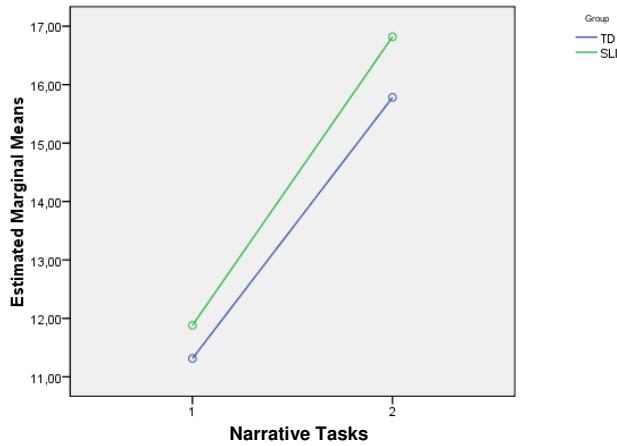


Figure C12. Estimated marginal means in percentages of the use of intransitive verbs in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C13. Intransitive Use of Transitive Verbs

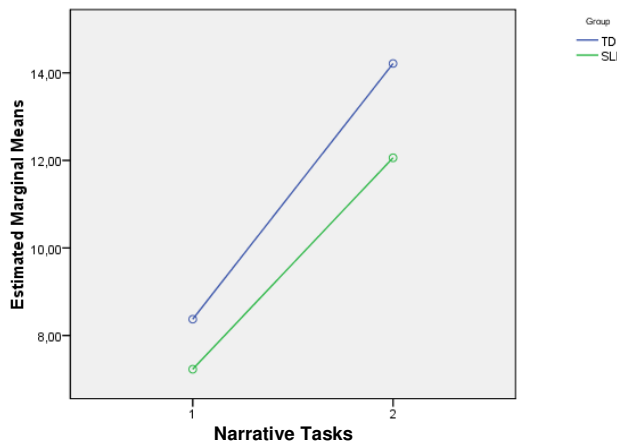


Figure C13. Estimated marginal means in percentages of intransitive use of transitive verbs in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C14. Transitive Use of Intransitive Verbs

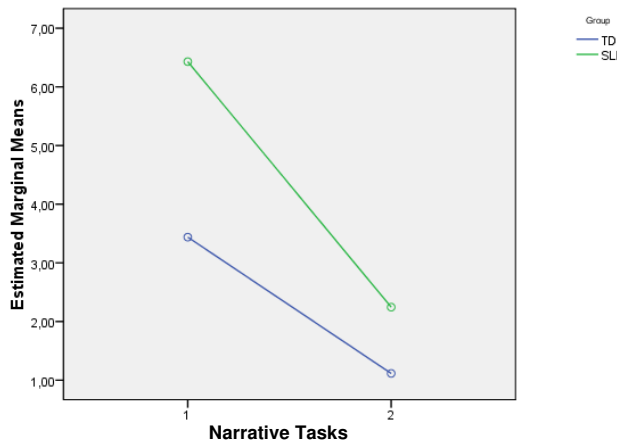


Figure C14. Estimated marginal means in percentages of transitive use of intransitive verbs in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C15. Transitive Verbs

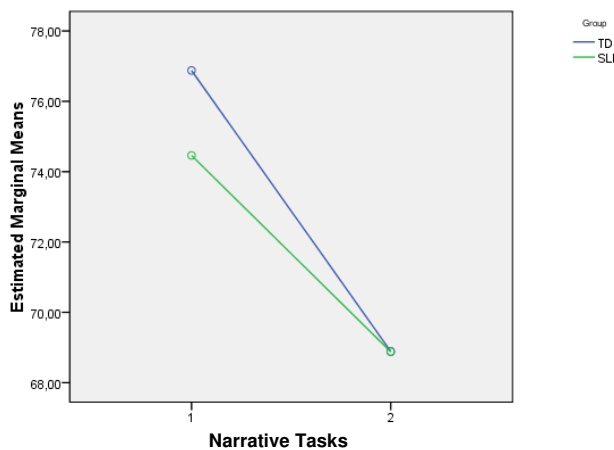


Figure C15. Estimated marginal means in percentages of transitive verbs in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C16. Present Tense

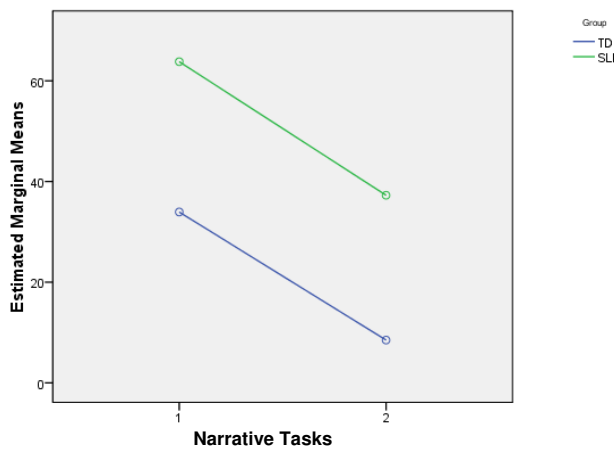


Figure C16. Estimated marginal means in percentages of the use of present tense in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

C17. Past Tense

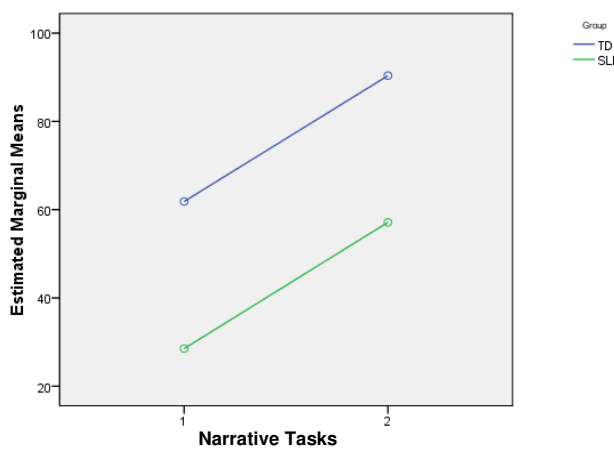


Figure C17. Estimated marginal means in percentages of the use of past tense in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).

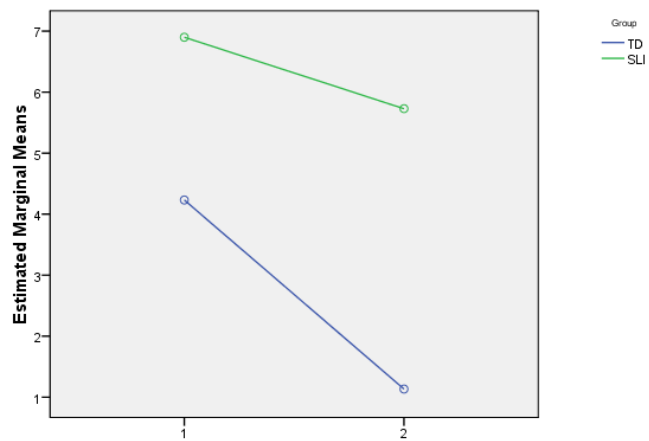
C18. No Time Marker

Figure C18. Estimated marginal means in percentages of the utterances without a time marker in the story generation task Frog Story (1) and the story retelling task Renfrew Bus Story (2) of TD children (blue line) and SLI children (green line).