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**Comprehension and production of relative clauses:  
a comparison between Swedish impaired and  
unimpaired children**

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ABSTRACT

The aim of the present study is to investigate the relationship between language comprehension and language production in Swedish children. This was done longitudinally with 10 children with specific language impairment (SLI), aged 4;0 to 6;3 at Time I, and 10 children with unimpaired language development, aged 3;1 to 3;7 at Time I. The target structure was subordination, more precisely relative clauses. The children's comprehension was tested with picture pointing, act-out and oral response tests. Their production was tested with elicited imitation and sentence completion tests. Data were collected twice, with an interval of six months. The results from the unimpaired children at Time I showed a difference between comprehension and production. At Time II these children scored higher on production than on comprehension. The children with SLI scored significantly higher on comprehension than on production at Time I. In half of the SLI group there was a clear development between the two data collection sessions, diminishing the dissociation. On neither testing did the children with SLI differ significantly from the unimpaired children in comprehension. At both testings, however, the children with SLI had significantly more

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responses where they did not insert the complementizer in relative clauses. The results indicate that the relationship between comprehension and production is different at different stages in development. They also show that structures involving dependency relations are particularly difficult to produce for children with SLI.

## INTRODUCTION

Most studies of language acquisition have focused on either comprehension or production, with a heavy bias towards the study of production, especially in studies of children in the early stages of acquisition. Nevertheless, the relationship between comprehension and production of language is an important issue in psycholinguistic research and has a long history, where different views have been put forward. The most popular assumption seems to be that language comprehension precedes language production (e.g. Ingram, 1974). Bloom (1974), on the other hand, argues that the relationship between comprehension and production is variable and in constant change during the course of development, depending on factors such as the context and an interaction between the child's growing linguistic and cognitive abilities. Comprehension and production are thus seen as different, but mutually dependent underlying processes. This view is supported by the fact that the results from studies comparing comprehension and production are not unanimous. In many studies it has been found that children perform better on comprehension tasks than on production tasks leading to the conclusion that comprehension is a prerequisite for production (Fraser, Bellugi & Brown, 1963). In other studies, for example Chapman & Miller (1975), the opposite has been shown.

From a generative perspective, the difference between comprehension and production in children's performance is problematic. How can one grammar at the same time yield complex structures (in comprehension) and simplified structures (in production)? Smolensky (1996) suggests that the child uses a full grammar in comprehension, but is constrained to use unmarked settings in production. This highlights the importance of studying developing production skills in language acquisition. The child needs not only the grammatical representations but also production skills in order to produce grammatical utterances.

Data from children with specific language impairment (SLI),<sup>1</sup> can be particularly helpful in the investigation of developing grammars, due to their slower pace of development (van der Lely, 1997a; Penner & Schönenberger,

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[1] SLI is defined as a significant deficit in language ability despite normal hearing, normal intellectual and social-emotional ability, and absence of frank neurological impairment (Stark & Tallal, 1981; Leonard, 1998).

2000). The relationship between comprehension and production in these children, who do not develop language as expected, has been investigated in a number of studies. One aim has been to define SLI and to classify the heterogeneous population of children with SLI into subtypes. In such classifications, different combinations and degrees of impairment of comprehension and production are often distinguished (Aram & Nation, 1975; Rapin & Allen, 1983). In the often cited criteria for the diagnosis of SLI in Stark & Tallal (1981), a 12 months delay of language production and a 6 months delay of language comprehension are required.<sup>2</sup> To describe the relationship between comprehension and production in children with SLI is, however, a difficult task, as pointed out by Bishop (1997), since it is variable and constantly changing; the variation is even larger than in unimpaired children. Furthermore, comprehension problems can be present on different linguistic levels (phonological, lexical, grammatical, pragmatic).

An interesting area for the study of the relationship between language comprehension and language production is how linguistic structures are connected to one another in hierarchical relations. The comprehension of structures with dependent relationships (e.g. reflexives, passives, syntactic recursion) has been studied in English-speaking children with SLI (van der Lely, 1997a, b). Van der Lely has proposed that some children have a REPRESENTATIONAL DEFICIT FOR DEPENDENT RELATIONSHIPS (RDDR). This could also be subsumed under the concept of coindexation (Müller & Penner, 1996).

One area of coindexation is subordination. This seems to be a particularly difficult area for children with SLI. Children with SLI use subordination more rarely than unimpaired children do. This has been found for German (Clahsen, 1991), Swiss German (Penner & Hamann, 1998; Penner & Schönenberger, 2000) and Swedish (Håkansson, 1998). 'It seems to be a stable feature of dysphasia that the children restrict themselves to co-ordinating conjunctions' (Clahsen, 1991: 147). Earlier studies have shown that children unable to mark hierarchical relationships by subordination, will use other strategies instead, such as co-ordination (cf. Clahsen, 1991), nonconjunctive clauses,<sup>3</sup> or dummy place holders (cf. Müller & Penner, 1996).

In the present study we will focus on the development of one type of subordinate clauses, relative clauses in children learning Swedish as their first language.

[2] Observe that this definition implies that the language impairment is commonly more of a production problem than a comprehension problem.

[3] Müller and Penner (1996) use the term 'preconjunctive clauses' for subordinate clauses without complementizers. We have chosen to use the term 'nonconjunctive' as a more descriptive term, not involving developmental implications. Penner and Hamann (1998) use the term 'complementizerless clauses' for the same structure.

*Subordination in Swedish*

Swedish is a verb-second language (V2 language) and belongs to the North Germanic language family. In V2 languages word order has important grammatical functions and marks mood (declaratives vs. interrogatives), as well as clause type (main clause vs. subordinate clause). In declarative main clauses, the finite verb is always in second position with the subject either preceding (SVX) or following the verb (XVS). In subordinate clauses, word order is always SVX. The negative marker appears after the finite verb in main clauses but before the finite verb in subordinate clauses. The relative complementizer *som* ('that') has an invariable form (irrespective of number, case and animacy of the antecedent). Examples 1 and 2 below illustrate main clause and subordinate clause structures.

- (1) Hans hund skäller inte  
 His dog barks not  
 'His dog doesn't bark'
- (2) Han har en hund som **inte** skäller  
 He has a dog that not barks  
 'He has a dog that doesn't bark'

Subordination is acquired rather early in unimpaired Swedish children and subordinate clauses are reported to appear before the age of two years. These early examples are sometimes nonconjunctive. The first subordinate clause type to be produced is the relative clause. At the age of two and a half years subordinate clauses are becoming more and more frequent and around the age of three years all types of subordinate clauses that occur in adult speech are also found in children (Lundin, 1987; Josefsson & Håkansson, in press). Thus, Swedish children start using relative clauses slightly earlier than has been reported for English-speaking children (Bowerman, 1979; Crystal, Fletcher & Garman, 1989) but around the same time as German-speaking children (Meisel & Müller, 1992).

*Aim of study*

The aim of this study is to compare the production and comprehension of Swedish relative clauses in children cross-sectionally, as well as longitudinally. Two groups will be investigated, one group of children with SLI and one group of unimpaired children. The following hypotheses will be tested:

- (a) comprehension precedes production  
 (b) this pattern will be particularly strong in children with SLI because of their slower development.

## METHOD

*Subjects*

Subjects of the study are 10 children with SLI and 10 unimpaired children with normal language development. These children were tested at two different occasions (Time I and Time II) with a six months interval. Before the experiment started, the children were pretested on general grammatical ability in production (The Lund Test of Phonology and Grammar; Holmberg & Stenkvist, 1983) and on comprehension (Swedish Test of Language Comprehension, SIT; Hellquist, 1989). The production test elicits plural forms, genitives, possessive pronouns, comparison, prepositions, negation and tense forms of verbs. The comprehension test includes items that deal with grammatical forms such as different tense forms of verbs, pronouns, prepositions, conjunctions and negation. These two screening tests are generally used for the assessment of SLI in Swedish clinical practice. Neither of them is standardized, but for research puposes, data from a limited number of unimpaired children are available.

The SLI group consists of 7 boys and 3 girls, aged 4;0 to 6;3 at the first testing (see Table 1). At the second testing one boy was not available for

TABLE 1. *Subjects*

Group	Number	Age range	Median age
SLI	10	4;0 - 6;3	5;0
Unimp.	10	3;1 - 3;7	3;5

testing, leaving only nine children in this group at this occasion. The children with SLI have been diagnosed as having language impairment with grammatical problems by their respective clinician. The criteria for inclusion in the study for the children in the SLI group were that they have normal hearing, that there is no suspicion of neurological, intellectual or social-emotional impairment and that they perform at least 2 s.d. below the mean for normal reference data on the language production screening test. They thus meet the criteria for the definition of SLI used in international research.

The unimpaired group consists of 5 boys and 5 girls, aged 3;1 to 3;7 (see Table 1). The criteria for inclusion in the study for the children in the unimpaired group were the same as for the SLI group (i.e. normal hearing and no suspicion of neurological, intellectual or social-emotional impairment), except that they perform within one standard deviation below the mean of normal reference data, or higher on the language screening tests, thus securing that their language development was proceeding as expected. The two groups are matched for their performance on the language

production screening test at Time I. Around 3 years is also the approximate age of normal controls that are MLU matched to children with SLI aged from four to six years (Hansson, 1997). Another reason for choice of age is that one of the elicitation methods of the study is an imitation test, which is difficult for children younger than this age (Bates, 1976; Connell & Myles-Zitzer, 1982; Chaudron, in press).

The mean score on the Lund Test of Phonology and Grammar of the children with SLI is 29.5, for the unimpaired children the mean score is 31.5 (see Table 2). On production, the children with SLI thus perform clearly

TABLE 2. *Results from the language screening tests*

Test	Maximum	SLI		Unimp.	
		Mean	s.d.	Mean	s.d.
Lund Test of Phonology and Grammar	46	29.5	6.6	31.5	5.7
Swedish Test of Language Comprehension	46	35.4	6.9	32.3	5.3

below age expectations, whereas all the children in the unimpaired group perform within normal age limits. On the Swedish Test of Language Comprehension, the children with SLI score on average 35.4, and the unimpaired children 32.2 (see Table 2). All the children with SLI, except one, perform within normal age limits on the language comprehension test, whereas all the children in the unimpaired group perform at or above age expectations. This implies that the SLI group in the present study consists of children with problems predominantly with expressive language. In a comparison between the groups, the Mann-Whitney *U*-test shows no significant differences between the two groups on either test. The children with SLI thus perform at a level corresponding to that of unimpaired children approximately one and a half to two years their juniors on the structures tested on the two screening tests (which do not include relative clauses). The Spearman rank order correlation test shows a positive correlation between the performance on language production and language comprehension for both groups (for the unimpaired group  $r_s = 0.76$ ,  $p < 0.01$ ; for the SLI group  $r_s = 0.82$ ,  $p < 0.01$ ).

#### *Procedure*

Three different tests are used to investigate the comprehension of relative clauses and two different tests to investigate the production of relative clauses. Each test has a different response mode. Comprehension of relative clauses was tested by picture pointing, act-out and oral response. Production of relative clauses was tested with elicited imitation and sentence completion

tests. A first version of the procedures was tested in a pilot study (Hansson & Håkansson, 1996), and then modified.

The children with SLI were tested in their home or in their daycare centre by a researcher. The normal controls were all tested in their daycare centre by a researcher. The testing sessions were audiorecorded. All children received the tests in the same order on both testings: picture pointing, elicited imitation, sentence completion, act-out and oral response. The testing was easy to carry out and most of the children were very eager to participate.

*Comprehension : picture pointing*

The items in the picture pointing test consist of some of the test items (blocks N and R) from the Test for Reception of Grammar (TROG; Bishop, 1989), in total 8 items. The test items were translated into Swedish and some items were changed in order to include a relative clause modifying the subject (where the original items in English have a prepositional phrase or an *ing*-form modifying the object). The children were given the instruction to listen to the researcher reading the test items, and to point to the picture which they found best illustrated what they had heard (see Example 3). Each test item had four pictures to choose between, systematically varying who is the subject and who has the characteristic that is mentioned.

- (3) Flickan jagar hunden som är stor  
 Girl-the chases dog-the that is big  
 'The girl chases the dog that is big'

*Comprehension : act-out test*

In the act-out test the tester showed the child a set of figures; one big and one small horse, one big and one small dog and a toy sofa. Before the testing started, the child was given six introductory test items, to make sure that (s)he understood the words and concepts used in the main test items (horse, dog, big, small, push, jump, and by/close to). The child was then asked to perform what was described in the test sentences read by the tester, using the animals (for a detailed description of the test, see Goodluck and Håkansson 1984). Example 4 below shows a relative clause modifying the subject, and Example 5 shows a relative clause modifying the object.

- (4) Hästen som är stor puttar hunden  
 Horse-the that is big pushes dog-the  
 'The horse that is big pushes the dog'
- (5) Hästen puttar hunden som är stor  
 Horse-the pushes dog-the that is big  
 'The horse pushes the dog that is big'



*Comprehension : oral response*

For the oral response test, the same test items as for the picture pointing test were used, but this time, after having heard the test sentence, the child was asked to demonstrate his/her comprehension of the sentences by answering questions, instead of pointing to pictures (see Example 6). No objects or pictures were used in this task.

- (6) Flickan jagar hunden som är stor  
 Girl-the chases dog-the that is big  
 'The girl chases the dog that is big'

After having heard the sentence the children were asked questions such as 'Who is big? Who chases?'.

*Production : elicited imitation*

Elicited imitation has often been used in the experimental study of child language development (Fraser, Bellugi & Brown, 1963; Slobin & Welsh 1973, Menyuk & Looney, 1976; Radford, 1990; Weissenborn, Höhle, Kiefer & Cavar, 1998). The underlying assumption is that the model sentence cannot be kept in the short-term memory but the child will interpret its semantic content and reconstruct it according to his/her own grammar. For the purposes of the present study, six sentences containing a relative clause were constructed. The tester read a sentence and asked the child to repeat it. The length of the sentences varied from seven to thirteen syllables, which is the length commonly used in experiments with pre-school children (Chaudron, in press). In three of the examples the relative clause was negated (e.g. Example 7), in the other three it was not (e.g. Example 8). The relative clause in each sentence modified a complement or an object.

- (7) Hon har en hund som inte skäller  
 She has a dog who not barks  
 'She has a dog who doesn't bark'
- (8) Jag känner en lady som skriver böcker  
 I know a lady who writes books  
 'I know a lady who writes books'

*Production : sentence completion*

The sentence completion test was carried out as a lotto game. The material consisted of two sets of pictures. One picture showed a person carrying out an action, for example sleeping, riding on a bike, taking a bath; the other picture showed the person not doing/not wanting to/not being able to carry

out the action.<sup>4</sup> The tester first named all the pictures to the child, then a lotto game was played, where main clauses with negation were elicited from the child. This was done in order to examine if the child had acquired main clause word order. Subsequently, the researcher went through all the pictures with the child once more, eliciting subordinate clauses by sentence completion (see Example 9).

(9) Prompt:

Titta, här är flickan som sover, och här är flickan...?  
 Look, here is girl-the who sleeps, and here is girl-the...?  
 'Look, here is the girl who sleeps, and here is the girl...?'

Expected answer:

som inte sover<sup>5</sup>  
 who not sleeps  
 'who doesn't sleep'

The test sentences in the picture pointing and oral response tests were identical, and the sentences in the act-out test were of similar structure as in the other two comprehension tests. Four sentences in each test had a relative clause modifying the subject, and four had a relative clause modifying an object, adverbial or complement (i.e. a post-verb element). As mentioned above, all these sentences had similar length in words, they were 6–7 words long (8–12 syllables). The test sentences in the production tests only had subordinate clauses modifying a post verb element. The sentences in the elicited imitation test were of similar length in words as the sentences in the comprehension tests, 6–8 words (7–13 syllables). The responses required from the child in the sentence completion test were shorter, 3–4 words (5–6 syllables).

### *Scoring*

Instead of calculating only number or proportion of correct responses, three scoring categories were used: correct response, incorrect response and null

[4] 'Not wanting to' and 'not being able to' are expressed with a modal+an infinitive in Swedish.

[5] As described earlier, the word order in Swedish subordinate clauses is always SVO and the negation precedes the finite verb (whereas it succeeds the finite verb in main clauses). All children have SVO word order in their correct relative clauses as well as in their nonconjunctive subordinate clauses. As for the placement of negation, this is a difficult area for Swedish children with SLI, who often place negation before the finite verb in main clauses as well. Their word order in negated subordinate clauses is therefore difficult to interpret. Many of the children in the study show a variable placement of negation both in main clauses and in subordinate clauses.

response. The third category is a type of response that is often discarded. This type of response can however provide important information, for example relating to the complexity of the task. In some cases it is also a way to give children some credit for attempting to interpret and contextualize the task. In the comprehension tests, a response was judged correct when the child pointed to the correct picture, carried out the correct action with the correct objects and gave the correct oral response respectively. Answers which resulted in pointing to the wrong picture, carrying out the wrong action or giving the incorrect oral response were scored as incorrect responses. Null response was scored when the child refused to respond, or responded completely irrelevantly (like choosing other alternatives than the ones offered). Mastery of relative clauses was measured by use of the relative complementizer (*som* in Swedish) i.e. all responses containing a relative clause with the relative complementizer were judged as correct responses in the scoring of the production tests. Responses which had the form of an attempted relative clause, without a complementizer (i.e. nonconjunctive subordinate clauses; Penner, 1996; Penner & Schönenberger, 2000), were judged as incorrect responses. All other types of responses as well as refusals to participate in the task were scored as null responses.

### *Reliability*

Reliability of the transcriptions and scoring of the responses was measured on all tests involving an oral response, i.e. the language production screening test, the oral response test of comprehension of relative clauses, and the elicited imitation and sentence completion tests of production of relative clauses. Using the audiorecordings, 20% of the data from the language production screening test, and 50% of the data from the oral response test of comprehension of relative clauses, and from the elicited imitation and sentence completion tests of production of relative clauses were transcribed by an independent judge. The reliability of transcription was measured in percent identical transcriptions on a word-by-word basis and was around 90% for all tests, except for the sentence completion test, where it was 83.6% (for details, see Table 3).

TABLE 3. *Reliability for transcription and scoring*

Test	Transcription	Scoring
The Lund Test of Phonology and Grammar	91.0	90.0
The oral response test	92.9	91.7
The elicited imitation test	89.6	95.0
The sentence completion test	83.6	98.3

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The reliability of scoring was measured in percent identical codings on 20% of the data from the language production screening test, on 50% of the data from the oral response test of comprehension of relative clauses, and on all data from the elicited imitation and sentence completion tests. Reliability of scoring was above 90.0% for all tests. All reliabilities are specified in Table 3.

*Statistical analyses*

The Wilcoxon signed rank test was used for comparison of the results from the comprehension and production tests and for the comparison between the results from Time I and Time II within the groups. The Mann-Whitney *U*-test was used for comparisons between the groups. The Spearman rank order correlation test was used for the calculation of correlations.

RESULTS

*Comprehension–production*

In order to make the results from the comprehension and production tests comparable, a total score for each set of tests has been calculated. The total score for comprehension represents the percentage of correct responses, out of all comprehension items (in total 28) and the total score for production represents the percentage of correct responses out of all production items (in total 15). The results from both groups and both testings are shown in Table 4. Table 4 shows that, for the group of unimpaired children, there is no

TABLE 4. *Comparison between comprehension and production in the two groups*

Group	Comprehension	Production	Probability
Unimp.			
Time I	48.2	55.3	n.s.
Time II	63.9	85.3	$p < 0.05$
SLI			
Time I	62.1	4.7	$p < 0.01$
Time II	75.8	50.4	n.s.

significant difference between their proportion of correct responses on the comprehension tests and on the production tests at Time I. Their overall performance on both comprehension and production is around 50%. Their results vary somewhat depending on the response mode. On the picture pointing test with 4 alternatives, three children perform at chance level (i.e. 2–3 correct responses out of 8), the rest perform above chance level. On the act-out test one child performs questionably (3 correct responses out of 8),

whereas the rest manage well (5–8 correct responses). Only two of the unimpaired children performed above chance level on the comprehension test requiring oral responses. On the production tests only two of the children in this group do not produce any relative clauses at all, and two responded 100% correctly. At Time II the unimpaired group have a significantly higher proportion of correct responses on the production tests than on the comprehension tests ( $p < 0.05$ ). They have on average 85% correct responses on the production tests and 64% on the comprehension tests. This is also shown in Table 4. All children perform above chance level on the comprehension tests at Time II.

The children with SLI, on the other hand, perform significantly better on comprehension than on production at Time I ( $p < 0.01$ ). This group have 62% correct responses on the set of comprehension tests, and only 4.7% on the set of production tests. Four of the children in the SLI group perform at or below chance level on the picture pointing test. All ten children with SLI manage well on the act-out test (5–8 correct responses). On the oral response test, four perform above chance level. On the production tests only three children with SLI produce any correct relative clauses at all, and at most four out of fifteen test items (26.7%). At Time II the group mean for production is 50% and the group mean for comprehension is 75%. This difference is, however, not significant, since five of the children perform better on production and four on comprehension.

At Time I the unimpaired group has a positive correlation between their proportion of correct responses on comprehension and on production of relative clauses ( $r_s = 0.74$ ,  $p < 0.05$ ). For the SLI group no correlation can be calculated, since seven out of ten children have no correct responses at all on the production tests. Correlations from Time II can not be calculated due to too many ties.

Correlations between the results on the screening tests and the results on the relative clause tests at Time I were also calculated. For the group of unimpaired children, there are positive correlations between their number of correct responses on the comprehension screening test and on the relative clause comprehension tests ( $r_s = 0.70$ ,  $p < 0.05$ ) as well as between their number of correct responses on the production screening test and on the relative clause production tests ( $r_s = 0.91$ ,  $p < 0.001$ ). For the group of children with SLI there are no significant correlations between their results on the language screening tests and the relative clause tests, nor for comprehension or production.

#### *Group comparison*

The mean scores from both testings on all five tests for the two groups of children and the results from the comparison between them are shown in Table 5. The figures represent mean number of responses in each scoring

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TABLE 5. *Comparison between the two groups of children and between Time I and Time II for each group*

	Unimp.			SLI			Probability for group comparison		
	+	-	o	+	-	o	+	-	o
Comprehension									
Time I	13.5	9.1	5.4	16.7	8.2	2.3	n.s.	n.s.	n.s.
Time II	17.9	7.1	3.0	21.2	5.7	1.1	n.s.	n.s.	n.s.
Probability for development	$p < 0.05$	n.s.	n.s.	$p < 0.05$	n.s.	n.s.			
Production									
Time I	8.3	2.5	4.2	0.7	11.6	2.7	$p < 0.01$	$p < 0.001$	n.s.
Time II	12.8	1.2	1.0	7.6	5.6	1.9	n.s.	$p < 0.01$	n.s.
Probability for development	$p < 0.05$	n.s.	n.s.	( $p = 0.06$ )	$p < 0.05$	n.s.			

category. There are no significant differences between the groups in any of the comprehension tests for any scoring category, either at Time I or at Time II.

The total score on the production of relative clauses, shows that at Time I the unimpaired children have significantly more correct responses ( $p < 0.01$ ), whereas the children with SLI have significantly more incorrect responses ( $p < 0.001$ ), i.e. responses without the relative complementizer. This occurs in 77.3% of the responses from the children with SLI but only in 16.7% of the responses from the unimpaired children. The group data show that this pattern persists at Time II. The SLI group still have significantly more responses without the relative complementizer (37% in the SLI group versus 8% in the unimpaired group;  $p < 0.01$ ), and the unimpaired group tend to have more correct responses, although this difference is only close to significance ( $p = 0.06$ ).

The two production tests, sentence completion and elicited imitation, make quite different demands on the children's performance, which is seen in the results. On the sentence completion test at Time I, the unimpaired children have significantly more correct responses ( $p < 0.01$ ), whereas the children with SLI have more incorrect ( $p < 0.01$ ) responses. All children, except for one child with SLI, participated adequately in this test. In the elicited imitation test, on the other hand, the unimpaired children often chose not to respond at all (in 38% of all imitation sentences). We find that the children with SLI produce more incorrect responses than the unimpaired children ( $p < 0.01$ ), but there is no significant difference regarding number of correct responses, since many of the unimpaired children avoid producing anything at all. Given these results, apparently the primary problem for the

unimpaired children is not the syntactic structure in itself, but the imitation task.

The imitation sentence *Hon har en hund som inte skäller* ('She has a dog that doesn't bark') may serve as an illustrative example of the different responses in the two groups at Time I. As is shown in Table 6, four of the

TABLE 6. *Examples from the elicited imitation test from the unimpaired children*

Child	Model sentence: Hon har en hund som inte skäller	(She has a dog that not barks 'She has a dog that doesn't bark')
1	No response	
3	No response	
6	No response	
9	No response	
2	Ingen skäller	'None barks'
4	Lisa (name)	
5	Hon har en hund som inte skäller	'She has a dog that not barks'
7	Jag har en hund som skäller	'I have a dog that barks'
8	Jag har en hund som inte skäller	'I have a dog that not barks'
10	Hon har en hund som inte hon kan skälla	'She has a dog that not she can bark'

unimpaired children refuse to imitate, four imitate the sentence with the complementizer (child 10 together with a resumptive pronoun), and two children change the semantic content. One produces a noun phrase 'Lisa', as an answer, and one changes it into a main clause 'nobody barks'. Examples of responses on the same sentence from the children with SLI are shown in Table 7. As is illustrated in Tables 6 and 7, there is a striking difference

TABLE 7. *Examples from the elicited imitation test from the children with SLI*

Child	Model sentence: Hon har en hund som inte skäller	(She has a dog that not barks 'She has a dog that doesn't bark')
Greg	Jag inte vet	'I not know not barks'
Filip	Hund ha	'Dog have not barks'
Josef	Hon har en hund	'She has a dog not barks'
Robert	Hon har en hund	'She has a dog not barks'
Krista	Hon har en hund	'She has a dog not barks'
Tony	Hon har en hund	'She has a dog not barks'
Henrik	Hon har en hund	'She has a dog not barks'
Hillevi	Hon har en hund	'She has a dog not barks'
Fabian	Jag har ingen hund m	'I have no dog m barks'
Hanna	Hon har en hund som inte skäller	'She has a dog that not barks'

between the groups in how they perform the imitation task. Seven out of ten SLI children consistently omit the relative complementizer 'som' at Time I. Two children, Greg and Filip, made major changes in the sentences, but they follow the pattern of omitting the complementizer. Only one child, Hanna, supplies the complementizer in this example. However, in the majority of her examples of relative clauses, the complementizer is omitted. Interestingly, exactly the same type of nonconjunctive sentences appear in the production from SLI children in both production tests, which shows that the elicited imitation sentences are actually filtered through the children's grammar (cf. Slobin & Welsh, 1973).

A detailed analysis of the production from children with SLI reveals that nonconjunctive clauses are not the only options they use in order to cope with the task of imitating a grammatical structure that does not belong to their own grammar. An interesting example is the insertion of dummies in the place where the relative complementizer should have been, as in Example 10 below. The insertion of dummies, or fillers is a well-known phenomenon in child language development (cf. Peters, 1997).

- (10) Jag känner en flicka **m** inte äter äppel  
 I know a girl m not eats apple  
 'I know a girl who doesn't eat apple'

Another strategy used by the SLI children is to use co-ordination, by inserting co-ordinating conjunctions (Example 11) or producing the subject twice, the second time with a pronoun (Example 12).

- (11) Han känner en flicka **men** han äter inte äppel  
 He knows a girl but he eats not apple  
 'He knows a girl but he doesn't eat apple'  
 (Instead of 'He knows a girl who doesn't eat apples')

- (12) En kanin **hon** gömmer ungarna  
 A rabbit she hides babies-the  
 'A rabbit she hides the babies'  
 (Instead of 'A rabbit who hides her babies')

The use of this type of strategies shows that the child actually does comprehend the function of the relative clause, but does not reproduce the correct form in the imitation.

Finally a separate analysis was made to see whether there is a difference in the children's performance depending on whether the relative clause was modifying a subject or a post-verb element in the comprehension tests at Time I. An effect is only seen in the results from the act-out test, and only in the unimpaired group, where the children tend to give more correct responses to items where the relative clause modifies a post-verb element.



*Development from Time I to Time II*

A significant development is found in both groups of children in their performance on the comprehension tests, as measured by the total number of correct responses on the three comprehension tests ( $p < 0.05$  for both groups; see Table 5). Looking at individual data, all children except one in the group of unimpaired children have more correct responses on the comprehension tests at Time II. The increase is between 3 and 8 more correct responses. In the SLI group seven children have more correct responses on the comprehension tests. In this group the increase is between 3 and 10 more correct responses.

The group results also show development in the performance on the production tests. The children in the unimpaired group have significantly more correct responses at Time II ( $p < 0.05$ ). Only one of the children in this group gives responses without the complementizer at Time II. The unimpaired group also tends to have fewer unscorable responses at Time II ( $p = 0.05$ ), showing a development in their ability to cope with imitation. This is what accounts for the development in this group, rather than a decrease in the number of responses without the complementizer.

The development in the SLI group is evident in significantly fewer responses without the complementizer ( $p < 0.05$ ) and almost significantly more correct responses ( $p = 0.06$ ) at Time II. Looking at individual data, it is clear that the mastery of correct relative clauses is not a gradual phenomenon. Five of the children with SLI seem to have complete mastery of the structure at Time II, giving only one or two responses without the complementizer, whereas the remaining children still make no correct productions at all.

To summarize the results, the analyses show that for the group of unimpaired children, their performance on the comprehension tests of relative clauses at Time I is at the same level as their performance on the tests of production of relative clauses. At Time II they perform significantly better on production than on comprehension. The group of children with SLI shows a significant discrepancy between their performance on the comprehension tests as compared to their performance on the production tests at Time I. At Time II there is no longer any difference between comprehension and production.

For the unimpaired group the results on the tests of comprehension of relative clauses correlate with their results on the tests of production of relative clauses. For this group there are also correlations between their results on the language screening tests and the results on the relative clause tests. For the SLI group there are no such correlations. Both groups have significantly more correct responses at Time II compared to Time I. In comprehension the increase is distributed over all children, whereas in

production, in particular the children in the SLI group either jump to full mastery or do not develop at all.

## DISCUSSION

How do these results give an answer to the question about the relationship between language comprehension and language production? Our hypotheses were that (a) comprehension of relative clauses should precede production, and (b) this pattern should be more distinct in the children with SLI.

For the group of unimpaired children the results from Time I showed no difference between comprehension and production. This could be taken as evidence for a simultaneous development of production and comprehension, i.e. disconfirming hypothesis (a). However, the data do not tell us how things were earlier in development. Recall that Swedish children are known to start using relative clauses around the age of 2;0 and that our data collection started at the age of three years. The present study is thus limited to a particular stage in development. We cannot exclude the possibility of better performance on comprehension than on production at earlier stages in development. At Time II, six months later, the children in this group actually perform significantly better on production than on comprehension. In other words, production seems to have developed faster than comprehension. This result nicely illustrates Bloom's (1974) view of a variable and constantly changing relationship between comprehension and production in language development. A further manifestation of this variation is that the response mode seems to have an impact on the performance of the children, possibly larger the younger the subjects. How stimuli are presented and what is required for the child to respond correctly are factors that influence the results, in particular in comprehension testing.

The results from the SLI group show a quite different pattern. At Time I, these children perform significantly better on comprehension than on production, evidencing a distinct dissociation between comprehension and production. Especially the results from the act-out test demonstrate a good comprehension of relative clauses. However, none of the ten children in this group can be said to have mastered relative clauses in production at this point, since they omit the relative complementizer (most of them consistently). In the elicited imitation sentences, some of the children show that they understand the semantic content by changing subordination into coordination. In other words, they can understand the structure without being able to produce it. Response mode does not seem to play such an important role for these children as for the unimpaired children. The results from Time II for the SLI group indicate that, in this group, comprehension has preceded production in the development in at least five of the nine children. These five children now show full mastery of relative clauses in

production. At the same time, the whole group performs significantly better on the set of comprehension tests. The data from this group of children can thus be said to confirm both hypotheses.

Interestingly, the results also show that relative clauses (or subordination in general) is a structure particularly difficult for children with SLI. This structure has not received much attention in earlier research on SLI. Relative clauses are used productively by typically developing children long before age 3, whereas they do not seem to be acquired by the children with SLI until after 4;6. On the screening tests of general language ability, however, the group of children with SLI did not differ from the younger controls either on comprehension or production. The results from the production tests suggest that the relative clause is a structure where children with SLI have selective problems. The results also confirm that children with SLI constitute a heterogeneous group – actually increasing in heterogeneity with age.

The problem for the children with SLI seems to lie in the insertion of the relative complementizer. Why is this function word particularly difficult? According to a suggestion by Meisel & Müller (1992), complementizers develop out of prepositions. In their study children use the complementizer *für* ('for') as a preposition for a long time, before it is reanalysed as a functional category and used in subordinate clauses as well. Similarly, Josefsson & Håkansson (in press) found that the Swedish relative complementizer *som* ('that') surfaces in childrens' language development as a comparative preposition before it is used as a complementizer. In a case study of the child Embla, prepositions appeared three months before complementizers. Interestingly, prepositions as well as complementizers reached the 90% level of use in obligatory contexts exactly at the same time in the development. This implies that there is a longer period of variation of use of prepositions than of complementizers. The sudden rise in the use of complementizers can be taken to suggest that a reorganization of the grammar is taking place. The production of the relative complementizer can be seen as a manifestation of knowledge of a hierarchical relationship between clauses. The development from few or no complementizers at all at Time I to full suppliance at Time II for five of the children with SLI in the present study is an indication that this reorganization process, which is a prerequisite for hierarchical relationships, is completed.

Finally, a note on the influence of response mode. Comparison between the children's scores depending on response mode, showed that this is an important factor, determining the children's performance. Other studies have also shown this (Cocking & McHale, 1981; Hansson & Håkansson, 1996; Hansson, Håkansson & Bruce, 1997). In particular results from comprehension testing are difficult to interpret and easy to influence (Bloom, 1974; Golinkoff & Hirsh-Pasek, 1995; Nettelbladt, 1995; Bishop, 1997). For the younger unimpaired children, elicited imitation in production and oral

response in comprehension are not suitable response modes. In both these tests, the unimpaired children have large proportions of null responses (41.7 and 46.7% respectively). It is interesting to note that two of the youngest children (3;1 and 3;2 years respectively) refuse to participate in the elicited imitation and oral response tasks. In these two tests language is completely decontextualized (i.e. no referents are present). Some of the other children also tend to give null responses, others try to contextualize the task, for example by referring to objects in the physical context in responding to the oral response test (like pointing to a yellow table-cloth in response to the task: 'The pencil is on the book that is yellow. What is yellow?'). The act-out test in comprehension and the sentence completion test in production, on the other hand, are the most favourable conditions. These tasks provide more context and request action. The effect of response mode was less evident in the SLI group. Difficulties in coping with these two task types thus seem to be related to age more than to linguistic development.

#### CONCLUSION

The results obtained from the testing of comprehension and production of relative clauses in Swedish children with SLI and younger normal controls give an interesting contribution to the discussion on the relationship between language comprehension and production. In particular they show that the relationship between language comprehension and language production is difficult to pin down. For the period in development investigated in the two groups of children, they showed opposite patterns. The children in the unimpaired group were at similar levels in comprehension and production, with production becoming stronger. The children with SLI, on the other hand, scored higher on comprehension than on production, production starting to catch up at Time II. The data from this group show that it is possible to comprehend a linguistic structure such as subordination, before being able to use the lexical complementizer insertion rule which is obligatory in order to produce subordinate clauses.

There is also an important clinical implication of the present study. The lexical complementizer insertion rule in relative clauses could be regarded as a possible 'clinical marker' of SLI. At Time I all the children with SLI showed marked problems with producing the relative complementizer although they were able to produce other grammatical markers. At Time II at least four of the SLI children still had problems with the production of the relative complementizer. These results confirm earlier findings that co-indexation, as in subordination (Clahsen, 1991; Müller & Penner, 1996, Håkansson 1998) or in binding (van der Lely, 1997*a, b*) is especially difficult to produce for these children.

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