What's the point of going to school? A longitudinal study of reading and writing development of students differing in linguistic abilities

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What's the point of going to school? A longitudinal study of reading and writing development of students differing in linguistic abilities

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Introduction

At the first Nordic meeting for linguists with a research interest in reading and writing, held in Løgumkloster, Denmark, in 1987, we reported on a longitudinal study we had just started. The aim of the study was to find out which kind of linguistic disabilities are the most damaging for the development of reading and writing (Magnusson & Nauclér 1990 a, b).

When reading is looked upon as a linguistic skill to the same extent as speaking and listening, it is logical to find a majority of children with language impairments among students with reading and writing difficulties. However, all children diagnosed as language-impaired do not experience such problems at school. Since it was not obvious what kind of language problems were the most troublesome for the development of reading and writing, it was not possible to predict which language-impaired children were most at risk. This was the rationale for the longitudinal study in which we have followed the language development of impaired and normal children in pre-school, from the age of 6, until grade 12, when they are 18, in order to compare their linguistic and metalinguistic abilities in pre-school (i.e. before they were taught to read and write) with their development of reading and writing during the school years.

This paper will focus on the school's possibility to decrease the gap between students with and without language impairment. After presenting the subjects and the tests, we will give a short description of the subjects' oral and written language development in the first school years, and then a more detailed account of the outcome of the final tests when the subjects were about to leave school.

Subjects

The longitudinal study began with 78 language-impaired six-year-olds with no other known handicap, divided into two groups: a group of 39 subjects with

severe impairments who had treatment during their pre-school years, and a group of 37 subjects with *mild impairments* who were checked by a speech pathologist once or twice a year, but who were not enrolled in any language intervention program before starting school.

In addition there was a *control group* consisting of 39 children with no known language problems. They were individually matched for age, sex and non-verbal cognitive level (Raven's coloured matrices, Raven, 1956) to the severely impaired children. All in all there were 115 subjects in the study from the beginning. Swedish was their first language.

The language-impaired subjects in this study were all diagnosed as having a functional impairment, that is they were children whose language deficits could not be attributed to impaired hearing, mental retardation, emotional disturbances, physical malformations, etc. This diagnosis does not meet Leonard's definition (Leonard 1998) of specific language impairment (SLI). The subjects in our study had language problems or combinations of language problems affecting any linguistic level, including phonology.

The subjects were tested one year before starting school and again in grades 1, 3, 4 and 12. The number of subjects at the different test occasions is shown in Table 1.

Table 1. Number of subjects.

	Severely impaired		*Normal group*		*Mildly impaired*		
	Boys	*Girls*	*Boys*	*Girls*	*Boys*	*Girls*	*Total*
pre-school & grade 1	27	12	27	12	22	15	115
grade 3 & 4	22	9	24	10	21	12	98
grade 12							
questionnaire	21	9	21	10	20	12	93
testing	10	7	10	8	9	10	54

For the part of the study that is the focus of this paper, 106 of the original 115 subjects were identified. They were invited to take part in a final test session,

which included a test battery and a questionnaire. The questionnaire was filled out by 93 of the subjects, and 54 of them also took the full test battery.

Tests and Materials

The test battery comprises tests used in clinical practice and in assessment of reading and spelling. In addition, when no standard tests were available that met the requirements of the study, we used some tasks and procedures developed by us. The tasks were selected so as to assess the same abilities in both spoken and written form, and also to test the same language functions at all test occasions of the study in order to observe developmental trends. Figure 1 gives an overview of tests administered at different ages.

	pre-school 6 yr.	*gr 1 7 yr.*	*gr 3 9 yr.*	*gr 4 10 yr.*	*gr12 18 yr.*
ORAL LANGUAGE					
comprehension	X	X	X	X	X
production	X	X	X	X	X
WRITTEN LANGUAGE					
reading		X	X	X	X
spelling		X	X	X	X
writing			X	X	X
LINGUISTIC AWARENESS	X	X	X	X	X
SHORT-TERM MEMORY	X	X			X
QUESTIONNAIRE					X

Figure 1. Overview of tests administered at five different occasions.

Details of the different tests in the final testing with the 18-year-old subjects in grade 12 are presented below. Beside language functions we included information about reading and writing habits and the subjects' evaluations of their own reading and writing skills, obtained from the questionnaire. A detailed account of the tests used at the earlier stages of the study is found in Magnusson & Nauclér 1987.

Tests of oral language

Listening comprehension. A non-standardised Swedish translation of the Peabody Picture Vocabulary Test, PPVT (Dunn & Dunn, 1981), is used to measure receptive vocabulary. To assess sentence comprehension two tests are administered: an oral version of the Token Test (de Renzi & Vignolo, 1962) and an oral version of a syntactic comprehension task (Magnusson & Nauclér, unpublished).

Spoken language production. The subjects are encouraged to talk as much as possible about their hobbies and other topics of interest.

Word retrieval is measured with phonological as well as semantic triggering. In the phonological task, the subjects are encourage to say as many words as they can think of in one minute that started with /s/, and in the semantic task to name as many kinds of food as possible in one minute.

Phonology is examined by two repetition tasks: repetition of long and phonologically complicated words (Magnusson & Nauclér, unpublished) and repetition of phrases (tongue twisters) (Magnusson & Nauclér, unpublished).

Tests of written language

Decoding is assessed in four different ways: by means of a word chain test (Jacobson, 1993) and by reading aloud: non-word reading (Magnusson & Nauclér, unpublished), single word reading (Johansson, 1992), and text reading (Björkqvist & Järpsten, 1974).

Reading comprehension is examined in four different tasks: a test of single-word reading (Johansson, 1992), a written version of the Token Test (de Renzi & Vignolo, 1962), a written version of the syntactic comprehension task used to test oral comprehension (Magnusson & Nauclér, unpublished), and a test of text comprehension (Johansson, 1992).

Spelling is assessed by a test of single-word spelling (Magnusson & Nauclér, unpublished).

*Written language production***.** The subjects are asked to write about their plans for the future.

Tests of phonological awareness and short-term memory

Phonological awareness is assessed in two ways: by administering a phoneme metatheses task in which the subjects identify and produce spoonerisms (Magnusson & Nauclér, 1993), and by asking them to talk backwards (Magnusson & Nauclér, unpublished).

Verbal short-term memory is measured by repeating orally presented digits and words.

Non-verbal short-term memory is assessed by means of a visuo-spatial task, using Corsi blocks (Corsi 1972).

Results: pre-school – grade 4

In this part the report of the results will be restricted to comparisons between the matched groups. Thus, the 'language-impaired group' will only refer to the severely impaired group. It should be pointed out that the scores of the mildly impaired group fall in between the two matched groups reported here.

The problems of the language-impaired subjects varied from the beginning of the study; some of them had syntactic problems, others morphological and/or lexical problems. However, what they all had in common were phonological problems, i.e. a deviant phonological system due to an individual set of phonological substitution rules and/or structural rules. For some of the subjects, phonology was their only language problem.

From the start, the language-impaired group and the normal controls differed significantly[1] on all *language* tests, as shown in Table 2. Both comprehension and production were tested in a number of tasks including tests of syntax, morphology, phonology, and vocabulary (Magnusson & Nauclér 1987).

Table 2. Chronological age (in months), cognitive level (raw scores), and linguistic characteristics for the language-impaired (LI) (N=39), and the matched normal (N) group (N=39) at the pre-school testing. Numbers in parentheses indicate the number of test items.

Group		*Age*	*Raven*	*Lang. compr (33)*	*Synt. prod. (25)*	*Naming (20)*	*Phonol. deviance*
LI	mean	75.1	16.7	28.0	12.1	14.3	40.8
	s.d.	3.5	3.8	4.2	6.0	2.5	45.3
N	mean	76.2	16.9	30.4	16.7	16.6	0
	S.D.	3.4	3.6	2.4	3.5	2.4	

There was also a significant difference[2] on all tests tapping *linguistic awareness*, especially phonological awareness, as seen in Table 3. It is only to be

[1] Paired t-test, 2-tailed, p<.0026
[2] Paired t-test, 2-tailed, p<.0227

expected that phonological awareness in children with phonological impairments be less developed than in children without such problems.

In first grade, both the language-impaired subjects and their controls found reading single words (*word decoding*) easy, which is seen in Table 4. *Reading comprehension,* on the other hand, was much more difficult for both groups, and especially for the language-impaired group. However, the most difficult task in grade 1 was *spelling*. This is where we find the biggest difference (see Table 4).

Table 3. Correct responses for linguistic awareness tasks at the pre-school testing for the language-impaired (LI) group (N=39) and the normal (N) group (N=39). Numbers in parentheses indicate the number of test items.

Group		*Rhyme recognition*	*Phoneme identification*	*Syllable segmentation*	*Phoneme segment.*	*Morph/synt accept.*
		(24)	*(24)*	*(9)*	*(18)*	*(12)*
LI	mean	18.4	15.7	4.8	5.6	8.9
	S.D.	4.2	5.7	2.9	5.4 1.9	
N	mean	21.8	18.9	6.4	8.4	10
	S.D.	2.2	3.8	2.3	5.0	2.2

Table 4. Correct responses for word decoding, reading comprehension and spelling tasks in grade 1 for the language-impaired (LI) group (N=39) and the normal (N) group (N=39). Numbers in parentheses indicate the number of test items.

Group		*Word decoding*	*Reading comprehension*	*Spelling*
		(64)	*(60)*	*(25)*
LI	mean	56.3	32.1	12.1
	S.D.	12.2	15.7	7.5
N	mean	60.1	37.1	20.2
	S.D.	7.7	15.0	5.2

Two years later, there was no difference between the groups' ability to *decode single words.* It should be noted that all subjects scored high on this task as shown in Table 5. Both *reading comprehension* and *spelling* remained difficult

tasks for both groups, but unlike the results for spelling in grade 1 there was only a small difference between the groups in grade 3.

In grade 4, *word decoding* was excluded from the test battery because of the high scores obtained in grade 3. Only one reading task was given, i.e. *reading comprehension*, and a *spelling* task. Both groups found these two tasks difficult and were far from hitting the ceiling, which is shown in Table 6. Interestingly enough, there was no difference between their scores for the spelling task. Thus, the groups were equally poor spellers in grade 4. However, the difference in reading comprehension from grade 3 remained.

Table 5. Correct responses for word decoding, reading comprehension and spelling tasks in grade 3 for the language-impaired (LI) group (N=36) and the normal (N) group (N=35). Numbers in parentheses indicate the number of test items.

Group		*Word decoding (12)*	*Reading comprehension (8)*	*Spelling (25)*
LI	mean	11.3	6.1	16.6
	S.D.	1.0	2.1	4.4
N	mean	11.3	7.1	18.1
	S.D.	0.9	1.7	4.0

Table 6. Correct responses for reading comprehension and spelling tasks in grade 4 for the language-impaired (LI) group (N=31) and the normal (N) group (N=34). Numbers in parentheses indicate the number of test items.

Group		*Reading comprehension (36)*	*Spelling (25)*
LI	mean	20.8	16.2
	S.D.	7.5	4.0
N	mean	23.7	16.2
	S.D.	5.9	4.0

Summing up the development from pre-school to grade 4: The difference in language production and comprehension as well as phonological awareness persisted and was reflected in differences in decoding, reading comprehension and spelling between the two groups in first grade. The differences in decoding and

spelling disappeared in grade 3 and grade 4, respectively, but the gap between the groups regarding reading comprehension remained. Thus, some but not all differences between the two groups disappeared during the first four school years.

To what extent do these previous differences between the groups persist after 12 years of schooling? The information gained from the questionnaire suggests that after 12 years of schooling there are still differences between groups with and without language impairments in pre-school, both concerning the subjects' reading and writing habits and their opinion about their reading and writing skills. The tendency seems to be that the greater the problems one has in pre-school, the less one reads and writes as an adolescent, and the lower one judges one's reading and writing skills. This does not necessarily mirror reality, however. It could be that subjects with early language problems underestimate their literacy skills or that the earlier problems have shaped their self-image. The results from the final tests will show to what extent the groups still differ in grade 12.

Results: grade 12

In this section are the results from tests of oral and written language, phonological awareness and short-term memory. The results from the mildly impaired group are also included (see Table 1).

Table 7. Group results for decoding tasks in grade 12.

	Severely impaired		*Normal*		*Mildly impaired*	
Test task	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
decoding						
word chains	62	14.3	71	11.2	71	13.1
non-words						
rate	26	6.2	28	8	28	6.6
no. correct	21	2.6	22	2	21	1.9
single words						
rate	64	12.1	63	13.5	66	15.8
no. correct	47	2.8	48	2.3	48	2.2
text						
rate	161	16	149	19	160	34

There are four different *decoding* tasks. On none of the tasks is there a significant difference between the severely impaired group and the normal control group (see Table 7). In fact, on some of the tasks, the severely impaired group is faster than the normal group, on some tasks slower, but the difference in rate is not significant, nor is there a significant difference in accuracy (unpaired t tests).

However, when we look at the results from the *reading comprehension* tasks, shown in Table 8, we find a different picture.

Table 8. Group results for written language tasks in grade 12.

	Severely impaired		*Normal*		*Mildly impaired*	
Test task	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
reading comprehension						
single words	12	8	31	5.5	30	7
token	21	2.4	23	1.4	22	1.6
syntactic compr.	22	3.1	25	2.7	24	2.8
text 19	6.6	24	4.3	24	5.9	
spelling	20	5	23	4	22	4

All four reading comprehension tasks show significant differences between the severely impaired group and the normal controls; single words ($t(30)=-2.68$, $p<.02$), Token test ($t(33)=–2.78$, $p<.01$), syntactic comprehension ($t(30)=-2.76$, $p<.01$), and text ($t(30)=-2.80$, $p<.01$). Again, the difference between the mildly impaired group and the control group is non-significant. When it comes to *spelling*, the severely impaired group spells fewer words correctly, but the difference is not significant ($t(29)=–1.62$, $p<.1163$). The same is true for the mildly impaired group, but their scores are closer to that of the control group.

The fact that reading comprehension of the subjects in the severely impaired group remains significantly lower than in the normal group is not surprising when *listening comprehension* is taken into account. As shown in Table 9, the results of the severely group are significantly lower than that of the normal group; (PPVT $t(33)=-2.67$, $p<.02$, Token test $t(33)=–2.92$, $p<.01$, and syntactic comprehension $t(33)=-5.23$, $p<.0001$). Also, in this respect, the mildly impaired group scores at the level of the normal group.

Table 9. Group results for oral language tasks in grade 12.

	Severely impaired		*Normal*		*Mildly impaired*	
Test task	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
comprehension						
PPVT	141	21	156	10	148	19
Token	20	2.5	22	1.4	22	1.6
syntactic compr.	19	3.3	24	3.2	23	3.2

From tasks given in both written and oral versions, it is apparent that the subjects in the severely impaired group perform even lower in the listening condition (i.e. the gap between them and the normal group is wider in the oral task than in the written task). This is the case, for example with syntactic comprehension, which is shown in Figure 2. It might be that the severely impaired subjects' good decoding abilities enhance their understanding of written language as compared to oral language.

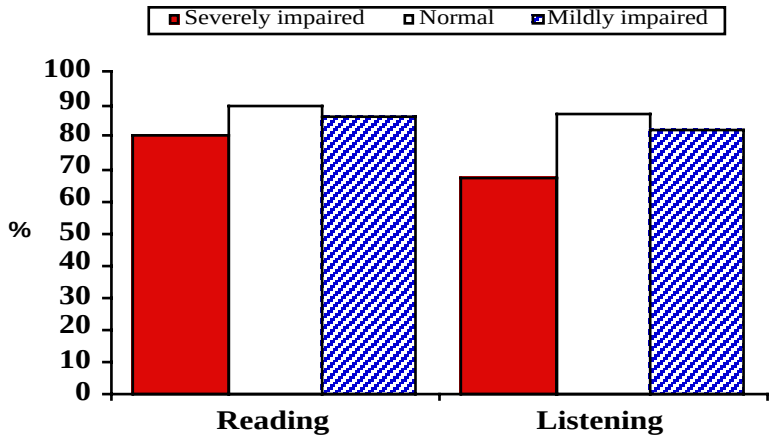

Figure 2. Results on syntactic comprehension in grade 12.

Thus, after 12 years of schooling the severely impaired group still performs significantly lower than the normal group on all language comprehension tasks, both written and oral. This is in contrast to the decoding tasks shown in Table 7. Their decoding ability has increased considerably and reached the level of the normal group. Other tasks considered to be closely associated with decoding, like

the *phonological awareness* tasks and *short-term memory* tasks show a similar pattern. This can be seen in Table 10.

Table 10. Group results for tests of phonological awareness and short-term memory in grade 12.

	Severely impaired		*Normal*		*Mildly impaired*	
Test task	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
phonological awareness						
metatheses						
identification	9.2	3.2	10.7	2.3	10	2.8
production	7.4	5	8.9	3.3	8.5	3.8
talking backwards						
rate	160	35	173	50	170	44
no. correct	13	1.2	13	1.7	13	1.5
short-term memory						
verbal						
digits	38	10.7	40	14.8	37	11
words	23	7.8	30	13.2	26	10.6
non-verbal	14	5.4	16	6.4	16	10.9

Table 11. Group results for oral language production tasks in grade 12.

	Severely impaired		*Normal*		*Mildly impaired*	
Test task	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
word retrieval						
semantic	16	6.3	21	6	18	5.5
phonological	15	6.2	17	4.6	16	4.8
word repetition						
rate	28	7.9	22	5.5	18	5.5
no. correct	10	1.5	11	0.8	11	1.5
phrase repetition						
rate	342	239	223	63	305	150
no.correct	3.3	1.5	4	0.8	3.6	1.5

For the oral production tasks (word retrieval and repetition) the picture varies (Table 11). There is a significant difference for word retrieval tasks with a

semantic trigger (t(33)=-2.46, p<. 02), but not with a phonological trigger (t(33)=-1.09, p=.2833). This is in contrast to what is reported in most other studies where phonological retrieval is found to be more problematic .

Furthermore, the severely language-impaired subjects are significantly slower and less accurate than the normal controls in repeating long and complicated words (t(32)=2.56, p<. 02 and t(33)=-3.56, p<.001, respectively), and slower in repeating tongue twisters (phrases) (t(32)=2.04, p<.05) but not significantly less accurate (t(33)=-1.70, p=.0978).

It should be noted that the shortcomings of the severely impaired subjects when repeating long and complicated words and tongue twisters are not due to impaired motor production. We are inclined to regard it as a result of an overload of the system. Otherwise, the subjects would have shown similar problems when decoding words as when repeating them. Rather, with reference to the results obtained from identical oral and written tasks (Figure 2), written language (print) seems to offer support to oral language for these severely impaired subjects.

Discussion

The poor results that the severely impaired group gained in many of the tasks were not unexpected. In a retrospective study of Danish adults with a history of severe language impairment, Hauschild & Elbro 1992 found no signs of 'recovery'. Rather, very few of their subjects had completed main stream school or had ordinary jobs. Recently, Stothard et al. 1998 in a longitudinal study showed that pre-school children do not outgrow their language problems even at the age of 16. The impairment takes a different shape, turning more pertinent in written than in oral language. Our severely impaired subjects, however, did not show any impairment in oral language production at the age of 18 except when the system was overloaded, but their comprehension of oral language, as measured in a syntactic task, was even more impaired than their reading comprehension, measured by the same task.

In another British study (Goulandris et al. 2000) with dyslexic and specifically language impaired (SLI) children as adolescents, it was shown that a group of resolved SLI scored at the same level in oral and written language as age-matched controls on all tasks, except phonological awareness and non-word spelling. A group of persistent SLI, however, behaved as a group of reading-matched (younger) controls on both oral and written language tasks. At a first glance, our mildly impaired and severely impaired groups correspond to their two groups of resolved and persistent SLI, respectively, and the results could thus be expected to coincide. However, oral (listening) comprehension was not tested in

the British study, so we do not know whether the comprehension of the subjects with persistent SLI was as poor as that of our severely impaired subjects. Furthermore, phonological awareness of our severely impaired subjects was not significantly lower than that of the age-matched normal controls. When it comes to written language it is obvious that our severely impaired subjects do not decode words and non-words or spell significantly worse than their age-matched controls, whereas the subjects with persistent SLI in the British study performed at the level of younger controls. The reading area in which our severely impaired subjects score significantly lower than the controls is in reading comprehension. It is unclear to us whether the reading comprehension task used by Goulandris et al. assesses the comprehension of words or sentences and, hence, it is not possible to make any comparisons. It seems safe to conclude, though, that our severely impaired subjects, in spite of being phonologically impaired as pre-schoolers, differ from the subjects with persistent SLI in the Goulandris et al. study by having no or very little phonological processing problems (phonological awareness, decoding and spelling), but being very impaired in both oral and written comprehension.

This discrepancy can have many reasons. For example, since our definitions of SLI are not identical, we include non-comparable subjects in our studies and use tests that don't assess the same linguistic skills. However, although the results of various studies differ in relevant aspects, they all give a gloomy picture of language-impaired children's academic career.

Conclusions

The results we have reported do not show a bright picture for language-impaired children's school carrer in general. The best we can say is that the academic achievement of mildly impaired subjects has been successful. After 12 years at school, they reached the same level as a control group with respect to decoding, reading comprehension and spelling. Also, severely impaired subjects improved in certain areas; when they are about to leave school they decode words and texts and spell at the same level as normal subjects. Phoneme awareness, as important a prerequisite as it might be for beginning to read and write, does not differ between language-impaired and normal students at the end of school. In a very crucial area, however, school has failed. Receptive vocabulary, syntax, and morphology of language-impaired students remain below the mean for the normal subjects throughout school. This is no doubt the reason why reading comprehension as well as listening comprehension of the severely impaired

students does not improve enough and they continue to score significantly below the level of their normal age-matched peers.

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