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**THE LANGUAGE DEVELOPMENT OF A WELSH-SPEAKING
CHILD WITH A COCHLEAR IMPLANT**

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Hearing impairment in young children can cause severe reduction in oral/aural input in the critical period for language acquisition. The subject of this study became deaf at 18 months and received a cochlear implant two years later, aged 3 1/2. This caused a delay in renewed onset language development post cochlear implant. The child was recorded for nearly three years and the data analysed to evaluate his progress in the acquisition of the functional systems: the D-system, the I-system, and the C-system. The three functional systems have emerged but the C-system is still incomplete.

Introduction: language acquisition

Language acquisition under normal circumstances is well documented, and it is recognized that by the age of three, children have acquired the key grammatical features of their first language. However the language acquisition process can be seriously affected if special circumstances modify the child's linguistic environment.

Loss of hearing is a selective impairment, which can greatly and in some cases totally reduce the auditory language input. The majority of children suffering from severe hearing loss have no other pathology and present no learning difficulties beyond their hearing loss. While deaf children exposed to a sign language from birth follow patterns of language development similar to children acquiring a spoken language (Bellugi, van Hoek, Lillo-Martin, and O'Grady 1993), language delay is observed in hearing-impaired children exposed to oral/aural input. Their language development varies according to the type of deafness — congenital or acquired, pre-lingual or post-lingual — and the degree of residual hearing. Bamford and Mentz's (1979) extensive study showed that language development in hearing-impaired children follows the same sequences as in normally hearing children but at a somewhat reduced pace, and the delay may become so marked that these children may never attain full language competence (De Villiers, De Villiers, and Hoban 1994).

Children suffering from hearing loss can benefit from traditional hearing aids, but in the last 20 years new technologies have resulted in the development of new rehabilitative procedures involving direct stimulation of the cochlear nerve by cochlear implants bypassing the abnormal hair cells in the inner ear. This has now become a standard procedure in most developed countries with some 700 children having received cochlear implants in the UK and 40 in Wales, four of whom are Welsh speaking.

The conditions under which children with cochlear implants acquire language are markedly affected both by the age of exposure to auditory linguistic input and by the quality of that input. There is some evidence that children with cochlear implants are capable of acquiring vocabulary at a relatively fast rate (Willis and Edwards 1996). However Curtiss (1989) points out that a distinction ought to be made between the ability to acquire vocabulary and use it in multi-word utterances and the ability to construct sentences with full a grammatical structure.

The following examples collected in a South Wales clinic are not atypical of children with cochlear implants even a few years after the operation. Sentences (1) and (2) are from a child aged 10 years and eight months (10;8) with a hearing age of 4, having received a cochlear implant at 6;8, while (3) and (4) are from a 4;6 year old who received a cochlear implant at 3;6.

- (1) The man jump the horse.
- (2) Man climb help cat, frightened house.
- (3) Sophie not feeling well.
- (4) Sophie, Mummy piggyback upstairs.

Both children are lacking essential grammatical categories such as tense and agreement, even determiners and pronouns are not used systematically, and names are frequently preferred to personal pronouns. These children also show difficulties in constructing interrogatives and subordinate clauses.

However, children with cochlear implants seem to be at an advantage compared to other profoundly deaf children with hearing aids. Spencer, Tye-Murray, and Tomblin (1998) found that they were using grammatical inflections in greater number than the children with hearing aids. Grammatical inflections are essential to the grammaticality of sentence and phrasal structures.

Most of the research on the language development of children with cochlear implants has concentrated on speech recognition and production and very little on the grammatical structure of their language. Coerts and Mills (1996) found that children who had lost their hearing after the age of three made greater progress in their development of language after implantation than those who had become deaf before the age of three, confirming a widely held view of a critical period for optimal language development, (Lenneberg 1967, Curtiss 1977).

Many of the children who have received a cochlear implant have experienced a period of profound deafness and thus have been denied continuous early exposure to adequate spoken auditory language input. Children acquiring language under normal circumstances have acquired the essential grammatical structures of language by the age of three. Prelingually deaf children receiving a cochlear implant after the age of three have missed out on that critical first period of language acquisition. One of the questions to be addressed is how this deprivation of input in the early years affects the language acquisition process.

The present case study of a Welsh-speaking child has been undertaken with the aim of assessing his linguistic development over a two and a half year period and of determining whether progress follows the same pattern as for children acquiring language under normal circumstances. The rest of the paper is organised as follows. The first section outlines the relevant aspects of the Welsh language within the Principles and Parameters Approach (Chomsky 1995). It is followed by the method section, the analysis of the results and discussion, and the conclusion.

Linguistic analysis

In the Principles and Parameters Approach, lexical categories are divided into two groups: contentives (nouns, verbs, adjectives, adverbs, and prepositions — items with full lexical content) and functors or grammatical items which have no or little lexical semantic content but which are essential to the grammaticality of the sentence. Functors can be either independent or free morphemes such as pronouns and auxiliary verbs or inflectional or bound morphemes such the plural *-s* of nouns or the past tense *-ed* ending of verbs in English. It is the development of grammar reflected in the use of functional categories which seems to cause the greatest difficulties for children with hearing impairment (De Villiers and De Villiers 1994).

The structure of Welsh

Functional categories in Welsh

Functional categories are grouped in three major systems: the D-system (Determiner system) associated with the noun phrase, the I-system (Inflectional-system) associated with the verb, and the C-system (Complementizer-system) associated with the clause.

The D-system

The Determiner system of Welsh includes the article, the genitive construction, and the pronouns. The definite article *y* is realized as *yr* if preceding a vowel and reduced to a weak *r* which cliticizes onto the preceding word if it ends in a vowel such as *mae* 'is' (the 3rd person present tense form of *bod* 'be').

- (5) *yr afal.*
the apple
- (6) *y ci.*
the dog
- (7) *Mae'r ci yma.*
is+the dog there
'the dog is there'.

There is no genitive morpheme and possession is marked by word order only, with the possessed noun phrase preceding the possessor.

- (8) *car Meiron.*
'Meirion's car'.

Subject pronouns are retained in colloquial Welsh in spite of the rich subject-verb agreement morphology. Welsh pronouns show person and number distinctions and an additional masculine/feminine distinction for the 3rd person. There is no nominative/accusative distinction.

- (9) *Mae hi yma.*
is she here
'She is here'.

The Welsh clause and the I- and C-systems

The Welsh I-system divides into tense and agreement. The agreement is richer than in English, with a different inflection for each person. The past tense morpheme is *-odd* but in spoken Welsh there is no other tense distinction carried by a bound morpheme.

- (10) *Gwelodd Tomos geffyl yn yr ardd.*
Saw Tomos horse in the garden
'Tomos saw a horse in the garden'.

There is no modal system comparable to the English one, and the main auxiliary verb is *bod* 'be'. It is referred to as copula *bod* in Jones and Thomas (1977) although it has an important function as the main auxiliary in Welsh sentences. There are various subtypes to the copula as the result of tense and person contrast and distribution, some of which are illustrated below.

VSO structures

Welsh is a VSO language and there is no variation in the word order of the three main clause types, but the auxiliary *bod* has a declarative, an interrogative, and a negative finite form for each clause type.

- (11) *Mae Tomos yn mynd.* [Declarative]
is Tomos ASP go.
'Tomos is going'.
- (12) *Ydy Tomos yn mynd?* [Interrogative]
is Tomos ASP go
'Is Tomos going?'
- (13) *Dydy Tomos ddim yn mynd.* [Negative]
is+NEG Tomos NEG ASP go
'Tomos is not going'.

Non-VSO structures

Non-VSO sentences include interrogatives and focused constructions; they are similar in structure, and the morphological realization of *bod* in both constructions is linked to the category of the preceding constituent.

Interrogatives

(14) a. Pwy sydd yn yr ardd?
 who is in the garden
 'Who is in the garden?'

(15) a. Pwy yw hwn?
 who is this
 'Who is this?'

(16) a. Ble mae Tomos?
 where is Tomos
 'Where is Tomos?'

Focused

(14) b. Tomos sydd yn yr ardd.
 Tomos is in the garden
 'Tomos is in the garden!'

(15) b. Tomos yw hwn.
 Tomos is this
 'It's Tomos!'

(16) b. Yn yr ardd mae Tomos.
 in the garden is Tomos
 'Tomos is in the garden!'

If the fronted constituent is an indefinite subject, *bod* 'be' is realized as *oes*:

(17) Oes bara ar y bwrth?
 is bread on the table
 'Is there bread on the table?'

In addition to the morphological variations of the verb associated with the I-system, there are other functor elements — two conveying aspect (the progressive particle *yn* and the perfective *wedi*), and another particle *yn* used in predicative structures:

(18) Mae Tomos yn mynd. [Progressive *yn*]
 is Tomos PROG go
 'Tomos is going'.

(19) Mae Tomos wedi mynd. [Perfective *wedi*]
 is Tomos PERF go
 'Tomos has gone'.

(20) Mae Tomos yn ifanc. [Predicative *yn*]
 is Tomos PRED young
 'Tomos is young'.

Welsh language acquisition: normal and experimental circumstances

The first results of the studies on language acquisition by Aldridge, Borsley, and Clack (1995) and by Borsley and Jones (1997) indicate that

monoglot Welsh-speaking children follow the patterns identified by Radford (1990), with three stages: (1) an acategorical stage, (2) a lexical stage, and (3) a functional stage. The first stage is the stage of single word utterances which cannot be assigned to any word class. In the second stage words can be identified as belonging to one of the four main categories from their morphological features, for instance, plural endings for nouns. The early multiword utterances have the structure of Small Clauses consisting of a subject and a predicate, but also including many instances of missing subjects. The third stage is marked by the emergence of the functional categories: the D-system, the I-system, and the C-system. Evidence is both morphological (inflection) and structural (clause type). Radford (1996) views language development under normal circumstances as a structure-building process, ordered in such a way that the D-system emerges first, followed by the I-system and completed by the development of the C-system.

Method

This study is based on an individual case study over a two and a half year period during which the child was video-recorded in school most of the time and occasionally at home. The data were transcribed, formatted to CHAT (see MacWhinney 1995), and analysed using a linguistic analysis based on the Principles and Parameters Approach (Chomsky 1991).

Subject

The participant in this study, Dewi, is a boy who comes from a Welsh-speaking home and attends a Welsh medium state school. He is fully integrated in the mainstream education system with the support of a non-teaching assistant. Dewi became deaf after developing meningitis at 18 months. He received his implant two years later, aged 3;6. The first two non-teaching assistants who worked with Dewi used a combination of sign and speech with him and they had reached level 2 in BSL, but the third and current assistant does not sign. Although Dewi used signs when first recorded, there is little evidence in the recordings that he uses signs now. Dewi's speech is clear and his intonation is good, without the typical features of the speech of profoundly hearing-impaired children.

Data

The data were collected by video recording, and the length of the video

tapes ranges from 31 minutes to 1 hour, 8 minutes. The aim was to obtain recordings between 45 minutes to one hour long. The recording sessions are listed in Table 1 together with chronological age and number of years post-implant for each session.

Table 1: List of recording sessions

Recording	Date	Location	Chronological age	Years post implant
1	17/03/97	School	7;1	3;5
2	21/04/97	School	7;2	3;4
3	18/06/97	School	7;4	3;8
4	26/07/97	Home	7;5	3;9
5	22/11/97	Home	7;9	4;2
6	9/03/98	School	8;1	4;5
7	02/07/98	Home	8;5	4;10
8	26/08/98	Home	8;6	4;11
9	22/03/99	School	9;1	5;6
10	10/06/99	School	9;4	5;8
11	27/09/99	Home	9;7	6;0

Date of birth: 08/02/90. Date of implant: 21/09/93. Age at implant: 3;7

The recordings were transcribed by a Speech and Language Therapist from the same area. CHILDES (Child Language Data Exchange System; see MacWhinney 1995) was used to create a database, and the transcripts were formatted using CHAT (Codes for the Human Analysis of Transcripts). The data were then analysed for the word mean length of utterances (MLU) and word sequences using the CLAN (Computerised Language Analysis) programmes to identify the structures which reflect the development of the three functional systems. The MLU results were calculated in number of words and not in number of morphemes, as the data were especially coded to identify bound morphemes.

The examples (21)-(23) illustrate the limitations of Dewi's constructions. His utterances in the first recording sessions consisted essentially of enumerations involving counting or naming:

- (21) un dau tri pedwar pump chwech. [Recording 1]
one two three four five six

- (22) dad a Les a Dewi a Johnathan. [Recording 3]
dad and Les and Dewi and Johnathan.

- (23) car glas .. un gloi ... car glas ... un car melyn. gloi ... car melyn
car blue one fast car blue one car yellow fast car yellow

- car glas ... gloi ... gloi slow ... gloi [Recording 5]
car blue fast fast slow fast

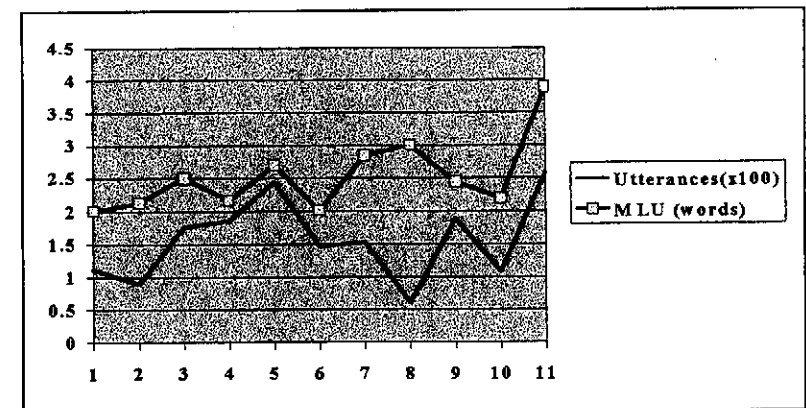
'blue car fast one blue car one yellow car fast yellow car
blue car fast fast slow fast'.

However progress was evident during the year and the structure of noun phrases became more complex especially as modifiers and specifiers were used, albeit inconsistently:

- (24) melyn ar ben y coch. [Recording 3]
yellow on top the red
'the yellow one on top of the red'.

The results given in Figure 1 indicate an increase in the length of utterances as well in the MLU, although the progression is not regular.

Figure 1: Utterances and MLU (in words) per session



The determiner system

The D-system is clearly emerging in Dewi's grammar, and the most common DP is formed by combining the article and the noun. Personal pronouns, too, are widely used, whereas possessive pronouns with nouns are less used.

Table 2: The Determiner system

Session	Number of utterances	Art N	NN	N Pr	Pr N	Pr N Pr	Pronouns
1	41	0	3	0	0	0	6
2	43	3	0	0	0	0	1
3	45	11	1	0	0	0	8
4	48	1	0	0	0	0	12
5	50	2	0	0	0	0	29
6	53	3	3	0	0	1	13
7	58	37	1	2	0	0	12
8	59	8	0	2	3	0	22
9	66	8	0	0	0	0	9
10	72	6	1	1	0	0	6
11	77	6	6	5	0	0	113

Art = article. N = Noun.

The following examples illustrate Dewi's use of determiners, including the articles, possessive pronouns, and possessive construction. His increasing competence in the use of personal pronouns is also reflected in the increase in the types of pronouns: from three in the first recording (*fe* [3rd singular masculine], *fi* [1st singular], and *ti* [2nd singular]) to six different types in the last recording, adding 3rd person *e* 'he' and *hi* 'she' as well as 1st person plural *ni* 'we'.

(25) Mae'r hwyaden yn y bocs glas. [Recording 7]
is the duck in the box blue.
'The duck is in the blue box'.

(26) Bet yw dy enw di? [Recording 6]
What is 2ndSg name 2ndSg
'What's your name?'

(27) Ie a fi ffrind a Jonathon. [Recording 8]
Yes and my friend and Jonathan
'Yes and my friend and Jonathan'.

(28) Ty tadcu Nerys. [Recording 9]
house grandad Nerys
'at Nerys's grandad's house'.

The I-system

Young Welsh-speaking children go through an infinitival verb stage (Borsley and Jones 2001) and finite verbs emerge later. It seems that at the time of the first recording Dewi was beginning to use finite verbs, but there is also a large number of non-finite verbs, and in that respect Dewi follows the early patterns of normally-hearing children presented by Borsley and Jones (2001).

Table 3: The inflectional system

Recording	Number of utterances	Aspect	Finite <i>bod</i>	Finite main Verb	Predicative <i>yn</i>
1	41	0	2	1	0
2	43	3	7	1	1
3	45	3	12	2	0
4	48	5	2	6	0
5	50	5	17	6	1
6	53	3	20	2	1
7	58	8	27	6	1
8	59	3	3	4	0
9	66	13	16	1	0
10	72	8	13	0	0
11	77	35	37	6	1

In the development of the I-system we observe the use of the aspect particles, the copula and auxiliary, the predicative particle *yn*, and the finite verb. The aspect particles *yn* and *wedi* are the first to emerge and they remain fairly high throughout the data.

The number of finite *bod* tokens increases, and in the last recording there were 37 instances of *bod* representing 11 different morphological realizations of that verb. In the last three recordings both the aspectual

particles and the finite *bod* are closely related, suggesting that sentences are becoming fully structured. The predicative particle *yn* is scarcely and infrequently used. It appears that the I-system is developing in Dewi's grammar as aspect and auxiliaries are being incorporated into his sentences.

The following examples illustrate Dewi's progress in clause structure from small clause structure to the fully grammatical sentence.

- (29) *fi dau.* [Recording 1]
me two
 'I have two'.
- (30) *mam a dad yn gerdded.* [Recording 3]
mam and dad PROG walk
 'Mam and dad walking'.
- (31) *fi 'di ennill.* [Recording 4]
I PERF win
 'I have won'.
- (32) *Mae mamgu yn mynd gartref fory.* [Recording 7]
is grandma PROG go home tomorrow
 'Grandma is going home tomorrow'.

Negatives

Although the negative *dim* is widely present in the data used as a negative quantifier, the number of negated clauses was rather low, as shown in Table 4. Only two full negative constructions occurred with either the negative adverb *dim* and the negative auxiliary. In the other instances *dim* negates a VP with a non-finite verb.

- (33) *dim wedi gorffen 'to.* [Recording 9]
NEG PERF finish also
 'I haven't finished either'.
- (34) *Dwi i ddim yn gwybod beth i neud.* [Recording 10]
am I NEG PROG know what to do
 'I don't know what to do'.

Table 4: Negative clauses

Recording	Utterances	Neg V	Neg S V	S Neg V	Neg Aux
1	41	1	0	0	0
2	43	0	0	0	0
3	45	0	0	0	0
4	48	2	0	0	0
5	50	0	0	0	3
6	53	0	0	0	0
7	58	0	0	0	0
8	59	2	0	1	0
9	66	0	1	0	0
10	72	0	0	1	4
11	77	1	0	0	2

Neg = negative marker. V = verb. S = subject. Aux = Auxiliary.

The development of Dewi's I-system can be described as evolving gradually and having reached a stage where *bod* and the aspectual markers are combined, suggesting that the structures of the I-system are present. The predicative particle *yn* is less frequent, and so are fully-constructed negatives.

The Complementizer system

Clear evidence for the emergence of a complementizer system is found in the use of subordinate conjunctions and the interrogative pronouns. Dewi's utterances are all single clause structures, with a few exceptions in all of the recordings. Although Dewi used interrogative words as clarification devices in conversation, there were no interrogative constructions before the 5th recording. Focused constructions were present from the 4th recording. The number of sentences with a complementizer system increased in the last recording. Examples are found in (35)-(37) below, and results summarized in Table 5.

- (35) *Beth yw hwnna.* [Recording 5]
what is that one
 'What is that one?'
- (36) *Ble mae'r pêl?*
where is the ball
 'Where's the ball?'

- (37) Faint sydd da ti?
 how many is to you
 'How many do you have?'

Table 5: Interrogative and focus clauses

Recording	Number of utterances	WH Aux	Topic Aux
1	41	0	0
2	43	0	1
3	45	0	0
4	48	0	2
5	50	5	1
6	53	1	1
7	58	10	1
8	59	2	0
9	66	2	2
10	72	1	1
11	77	10	14

WH = interrogative particle. Aux = auxiliary.

The C-system can be considered to be fully acquired if interrogatives, focus constructions, and subordinate clauses are present. In the case of Dewi only interrogatives and focus structures have been used, but there is little evidence of subordination, with the exception of the example in recording 11, a clause headed by *beth* 'what'.

- (34) Dwi ddim yn gwybod beth i neud. [Recording 11]
 am NEG PROG know what to do
 'I don't know what to do'.

As with other functors, the increase in number reflects an increase in type, and in the last recording there were five different interrogative pronouns: *beth* 'what', *ble* 'where', *faint* 'how many', *pam* 'why', and *prwy* 'who'.

The other important construction missing in Dewi's grammar is the restrictive relative clause, which can emerge late in the grammar of hearing impaired children. It is clear thus that he has not yet developed a full C-system, and in that respect he conforms to the findings of De Villiers, De Villiers, and Hoban (1994).

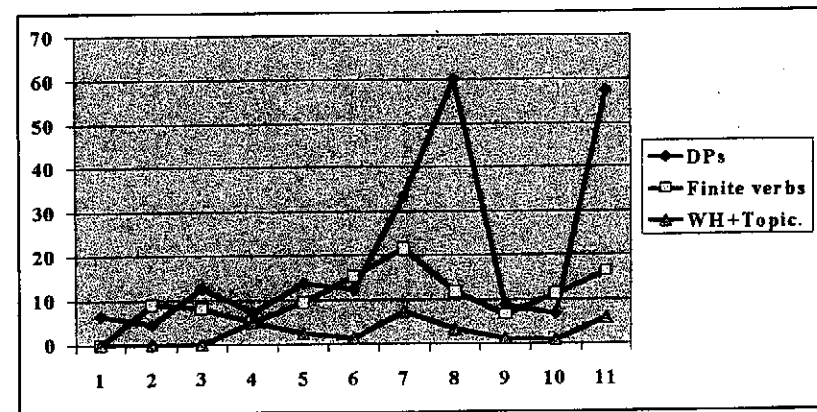
The next step towards the full development of the C-system will be the

acquisition of complex clauses. Children with normal hearing can use a variety of subordinate clauses. A brief survey of narratives by 9-10 year olds Welsh speaking school children has revealed that they are using a variety of subordinate clauses, including the *bod* infinitive.

Summary

Dewi's grammar has improved markedly in the three year period during which he has been recorded. His language development has progressed through the functional systems, and Figure 2 shows this achievement. It also shows that the D-system is the most advanced of the three, followed by the I-system — last to develop is the C-system. In that respect Dewi is no different to children acquiring language under normal circumstances (Radford 1996). The main difference for Dewi is in the length of time taken to reach this level. Under normal circumstances children's main grammatical categories develop in a short period, and Radford (1990) has claimed that in English the functional systems are acquired between 24 and 27 months. Six years after receiving the cochlear implant Dewi has not yet fully acquired the complementizer system, and subordinate clauses are still missing.

Figure 2: Summary of functional systems



However it is difficult to fully appreciate the extent of the delay in Dewi's case, as little is known about the later stages in the acquisition of Welsh. It is not therefore possible to predict if Dewi will reach the same

level of linguistic competence as normally hearing children. The fact is that he experienced a period of total deafness during the critical period for language development. The fact he had normal hearing until the age of 18 months can explain that his clear pronunciation and intonation, however the effect has been more serious on the development of language.

The data obtained from Dewi's recordings were not coded for errors, and it is therefore impossible to assess the strength of his grammar. Sentence fragments which are appropriate in conversation have not been separated from ungrammatical sequences. Nonetheless there is progression, and he can still progress towards achieving the best possible language development.

References

- Aldridge, M., R. Borsley, and S. Clack. 1995 The acquisition of Welsh clause structure. Paper presented at the Bristol Child Language Seminar.
- Bamford J. and J. Mentz. 1979. The spoken language of hearing-impaired children. *Speech-hearing Tests and the Spoken Language of Hearing-impaired Children*, ed. by J. Bench and J. Bamford. London: Academic Press
- Bellugi U., K. van Hoek, D. Lillo-Martin, and L. O'Grady. 1993 The acquisition of syntax and space in young deaf signers. *Language Development in Exceptional Circumstances*, ed. by D. Bishop and K. Mogford. Hove: LEA.
- Borsley R., and B. Morris Jones. 1997. The acquisition of Welsh syntax. Project Report, ESRC
- Borsley R., and Bob Morris Jones. 2001 The development of finiteness in early Welsh. *Journal of Celtic Language Learning* 6. 7-15.
- Chomsky N. 1995. *The Minimalist Program*. Cambridge: MIT Press
- Coerts, J., and A. Mills. 1996. Spontaneous language development of young deaf children with a cochlear implant. *International Cochlear Implant Symposium. Speech and Hearing*, ed. by G. Clark and R. Cowan.

- Curtiss, S. 1989. Issues in the language acquisition relevant to cochlear implants in young children. *Cochlear Implants in Young Deaf Children*, ed. by E. Owens and D.K. Kessler. Boston: College Hill Press.
- De Villiers J, P. De Villiers, and E. Hoban. 1994 *The Central Problem of Functional Categories in the English Syntax of Oral Deaf Children*. Hove: Earlbaum.
- Lenneberg E. 1967 *Biological Foundations of Language*. New York: Wiley
- MacWhinney B. 1995 *The CHILDES Project: Computational Tools for Analyzing Talk*. Hillsdale, NJ: LEA
- Radford A. 1990 *Syntactic Theory and the Acquisition of English Syntax*. Oxford: Blackwell
- Radford, A. 1996. Towards a structure-building model of acquisition. *Generative Perspectives on Language Acquisition*, ed. by H. Clahsen, 43-89. Amsterdam: John Benjamins
- Spencer L.J., N. Tye-Murray, and J.B. Tomblin. 1998. The production of English inflectional morphology, speech production and listening skills performance in children with cochlear implants. *Ear and Hearing* 19. 310-318
- Willis, N. and J. Edwards. 1996. A prelingually deaf child's acquisition of a spoken vocabulary in the first year of multichannel cochlear implant. *Child Language Teaching and Therapy* 12. 300-314