Time of cooing appearance and further development of speech in children with cerebral palsy

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Abstract

Purpose: **The aim of the study was to determine the significance of the time of cooing appearance for further development of speech in children with infantile cerebral palsy (CP).**

Material and methods: **The study was performed on a group of 46 children with the pyramidal form of CP, aged 3-16 years, treated in The Department of Pediatric Neurology and Rehabilitation, Medical University of Białystok. It included a logopaedic assessment and a history of speech development obtained from mothers.**

Results: **Speech development in CP children varied according to the time of cooing appearance. Particular difficulties were observed in children with delayed cooing, who usually said their first words between 2 and 5 years of age, sentences between 3 and 5 years or even later (8 or 11 years of age); 35% of these children did not use sentences at all. Moderate and severe dysarthria, limited lexical and grammatical development and problems with speech understanding of varied degree were observed.**

Conclusions: **Delayed cooing in CP is an important prognostic sign of further speech retardation and indicates the necessity of early logopaedic rehabilitation.**

Key words: cooing, speech development, infantile cerebral palsy.

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Introduction

The development of speech in CP children is usually retarded [1]. The most common speech disorder is dysarthria, observed in 50-80% of patients [2-4]. In dysarthric children, cooing is late, very poor, monotonous, long-lasting and does not assume more complex forms [5].

It is assumed that pre-verbal behaviours have a preparatory role in the development of proper speech. In literature, this period is defined as the preliminary phase in speech development and regarded as a "drill" of speech articulation and phonematic hearing [6]. It seems that the opinion on the lack of continuity between cooing and speech has drawn scientists' attention from that issue [7] and thus it is still the least scientifically described problem of infancy [8].

At present, cooing is gaining greater significance. Acoustic analyses prove that cooing bears a structural similarity to the language [9]. Cooing may reflect the first signs of speech development [10]. Researchers express the view that there is cooing-related continuity of speech development [11], pointing at the correlation between delayed cooing and further speech development [12].

The aim of the study was to determine the significance of the time of cooing appearance for further development of child's speech.

Material and methods

The study was performed in a group of 46 children, 3-16 years of age, with pyramidal form of CP treated in The Department of Pediatric Neurology and Rehabilitation, Medical University of Białystok.

Data concerning the time points of the respective speech stages were based on a history obtained from the mother. A logopaedic assessment of the speech included: speech intelligibility, articulation, articulatory motorics, reflexes, breathing, phonation, prosody, vocabulary, grammar, understanding.

Table 1. **Time of appearance of the first words and sentences in children with timely cooing (N=23)**

Age	Words		Sentences	
	N	%	N	%
Approx. 1 year	21	91.3	-	-
Approx. 2 year	2	8.7	17	74
Approx. 3 year	-	-	3	13
None	-	-	3	13

Table 2. **Time of appearance of the first words and sentences in children with delayed cooing (N=23)**

Age	Words		Sentences	
	N	%	N	%
Approx. 1 year	2	8.7	-	-
Approx. 2 years	10	43.5	2	8.7
Approx. 3 years	4	17.4	2	8.7
Approx. 4 years	2	8.7	1	4.3
Approx. 5 years	2	8.7	2	8,7
Approx. 8 years	-	-	2	8.7
Approx. 11 years	-	-	1	4.3
None	3	13	13	56.5

Table 3. **The current level of speech development in children with timely cooing (N=23)**

Severity of speech delay	Dysarthria		Lexicon		Grammar		Speech understanding		General development of speech	
		%	N	%	N	%	N	%	N	%
No	7	30.4	13	56.5	11	47.8	18	78.3	3	13
Mild	9	39.1	5	21.7	9	39.1	5	21.7	15	65.2
Moderate	7	30.4	3	13	2	8.7	-	-	5	21.7
Severe	-	-	2	8.7	1	4.3	-	-	-	-

Robertson's dysarthria scale (1986) was used to determine the degree of motor speech dysfunction (dysarthria). General level of speech development with all its aspects was also assessed.

Results

The study group of 46 CP children included 17 (36.9%) with hemiplegia, 16 (34.8%) with diplegia and 13 (28.3%) with tetraplegia. In 24 children (52.1%) intellectual development was normal, 5 (10.8%) had slight mental impairment, 8 (17.4%) – moderate impairment, while 9 (19.6%) – substantial and severe. Epilepsy occurred in 15 children (32.6%), 3 (6.5%) had hearing disorders.

Twenty-one children (91.3%) with a timely history of cooing said their first words around 1 year of age, 2 (8.7%) around 2 years of age; 17 (74%) uttered whole sentences at the right time (by 2 years of age), 3 (13%) by 3 years; 3 children (13%) used no sentences (*Tab. 1*).

Among the children with delayed cooing, only 2 (8.7%) uttered the first words at the right time, 10 (43.5%) in the 2nd year of life, 4 (17.4%) in the 3rd year, 2 (8.7%) in the 4th year, 2 (8.7%) in the 5th year, 3 (13%) did not say a word; 2 children (8.75%) began to utter sentences at the right time, 2 (8.7%) in the 3rd year, 1 (4.3%) in the 4th year, 2 (8.7%) in the 5th year, 2 (8.7%) in the 8th year, and even one (4.3%) in the 11th year; 13 children (56.5%) did not use sentences (*Tab. 2*).

Among the children with timely cooing, 7 (30.4%) had no dysarthria, in 9 children (39.1%) the disorders were slight, in 7 (30.4%) – moderate; no severe cases of dysarthria were noted. Vocabulary was adequate in 13 children (56.5%), slightly limited in 5 (21.7%), moderately in 3 (13%) and deeply limited in 2 (8.7%). In 11 children (47.8%) no grammatical abnormalities were noted, in 9 (39.1%) the abnormalities were slight, in 2 (8.7%) – moderate, in 2 (8.7%) serious. Speech understanding was generally normal in 18 children (78.3%) and slightly disturbed in 5 (21.7%). General development of speech was normal in 3 (13%) of the children, slightly disturbed in 15 (65.2%) and moderately disturbed in 5 (21.7%). No severe defects of general development of speech were observed (*Tab. 3*).

In the group of children with delayed cooing, dysarthria was not observed in only 1 child (4.3%), 5 (21.7%) had slight, 9 (39.1%) moderate and 8 (34. 8%) severe dysarthria symptoms. Vocabulary development was in the norm in 3 children (13%), slightly limited in 4 (17.4%), moderately limited in 5 (21.7%); in 11 cases (47.8%) severe disorders were observed. Speech was grammatically correct in 1 case (4.3%), in 5 patients (21.7%) grammatical abnormalities were slight, in 3 (13%) – moderate, in 14 (60.9%) severe. Three children (13%) had no problems with speech understanding, in 10 (43.5) the problems were slight, in 3 (13%) – moderate, in 8 (34.8%) – serious. General speech development was abnormal in all the children, in 5 (21.7%) the defects were slight, in 7 (30.4%) – moderate and in 11 (47.85) – severe (*Tab. 4*).

The list of disturbances concomitant with delayed and timely cooing is presented in *Tab. 5*.

Timely cooing was most common in children with hemiplegia (43.4 %) and diplegia (39.1%), and less common in those with tetraplegia (17.4%); it was most frequent in 17 children (73.9%) with normal intellectual development, but it also appeared in 3 (13%) slightly impaired children, in 2 (8.7%) moderately in 1 (4.3%) severely or substantially retarded, in 16 epilepsy-free children (69.6%) and in 7 (15.2 %) epileptic patients; none had hearing disorders.

Table 4. **The current level of speech development in children with delayed cooing (N=23)**

Severity of speech delay	Dysarthria		Lexicon		Grammar		Speech understanding		General development of speech	
	N	%	N	%	N	%	N	%	N	%
No	1	4.3	3	13	1	4.3	3	13	-	-
Mild	5	21.7	4	17.4	5	21.7	10	43.5	5	21.7
Moderate	9	39.1	5	21.7	3	13	3	13	7	30.4
Severe	8	34.8	11	47.8	14	60.9	7	30.4	11	47.8

Table 5. **Time of cooing appearance vs CP mental impairment, hearing defects and epilepsy**

Time of cooing	Types of CP						Mental retardation								Epilepsy				Hearing defects			
	Hemiplegia		Diplegia		Tetraplegia		None		Mild		Moderate		Severe		No		Yes		Yes		No	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Normal N=23	10	-	9	39.1	4	17.4	17	73.9	3	13	2	8.7	1	4.3	16	69.6	7	15.2	-	-	23	100
Delay N=23	7	30.4	7	30.4	9	39.1	7	30.4	2	8.7	6	26	8	34.8	15	65.2	8	34.8	3	13	20	87

The group of children with delayed cooing included: 9 (39.1%) with tetraplegia, 7 (30.4%) with hemiplegia and 7 (30.4%) with diplegia, 17 (30.4%) without mental impairment, 2 (8.7%) with slight impairment, 6 (26%) with moderate, 8 (34.8%) with substantial and severe mental retardation, 15 (65.2%) without epilepsy, 8 (34.8%) with epilepsy, 3 (13%) with hearing disorders and 20 (87%) with normal hearing.

Discussion

The study outcome demonstrates that speech development in CP children varies according to the time of cooing appearance. Special difficulties occurred in the group of children with delayed cooing. They said their first words usually between 2 and 5 years of age, sentences between 3 and 5 years, and even 8 or 11 years. Thirteen children (56.5%) did not utter a sentence, including 3 (13%) remaining at the stage of vocalisation. Moderate and severe dysarthria, substantial limitations of vocabulary and grammatical development, as well as speech understanding disorders of varied degree were noted in these children. Speech development abnormalities in this group of children are particularly serious and may last long; sentences may appear especially late. This confirms the necessity of often arduous and long-lasting speech therapy, which should not be discontinued.

Children with timely cooing acquired speech more easily, although not without problems. They also showed dysarthric symptoms and abnormalities in general development of speech but they were rather not severe.

Oller et al. [9], studying 3400 infants, revealed that children with delayed cooing had poorer vocabulary compared to normally developing children at the age of 18, 24 and 30 months. The authors suggest that this factor, a likely prognostic sign of further delay of speech development, can be effectively monitored by parents.

The most severe form of CP, i.e. tetraplegia, mental impairment (particularly the more severe one) and hearing defects are more common in the group of children with delayed cooing, as compared to those with timely cooing.

Oller et al. [13] investigated the frequency of cooing production in the group of children with retarded cognitive development, finding low correlation between cooing and developmental age. This, as they suggest, indicates actual independence of cooing from cognitive development in intellectually retarded children [13].

Epilepsy was observed in children both with timely and delayed cooing. Lack of correlation between cooing and epilepsy may result from the fact that epilepsy in CP usually appears later than cooing. In the study of Kułak et al. [14], epilepsy appeared between 3 and 5 years of age in children with hemiplegia and diplegia, and around one year of age in the case of tetraplegia.

Hearing defects were found only in 3 children and all of them had a history of delayed cooing. Eilers et al. [15] observed that deaf children were not able to produce coo sounds up to 11 months of age or later, often until 3 years. The authors indicate that lack of cooing above month 11 of age should be considered a serious indicator of the risk of hearing disorders.

Scheiner et al. [16] suggest that normal hearing is not the only factor necessary to produce pre-verbal utterances. Comparing vocalisations of well hearing and poorly hearing children (in the 1st year of age), they found that both groups of children had the same repertoire, with no differences in the time of preverbal productions; structural differences could be noticed only in crying.

Oller et al. [17], studying perinatal risk children, found that at the time of the research half of the patients with delayed cooing were burdened with serious medical diagnoses. As suggested

by the authors, late cooing may prognosticate later developmental dysfunctions reflected in speaking, language and reading.

The current study revealed that further speech development in children with delayed cooing was seriously retarded. Moreover, children with delayed cooing, as compared to those with timely cooing, more frequently had other developmental defects (severe CP – tetraplegia, mental impairment, hearing disorders).

In summary delayed cooing in CP children is an important prognostic factor of further speech retardation. Parents should be made particularly aware of the significance of this period as they have the greatest possibility of cooing monitoring. All CP children with a positive history of delayed cooing should undergo early rehabilitation of speech; for all the others preventive care is recommended.

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