PHONETIC AND PHONOLOGICAL LEVELS IN THE SPEECH OF THE DEAF

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ABSTRACT

The speech of eleven prelingually and profoundly deaf children, educated by sign-language, was videorecorded and was given a narrow phonetic transcription. The phonetic inventory of consonants used by the children in initial, medial and final word-positions was established. Analyses were also made to see what systematic deviations occurred for the speech sounds that the children could articulate correctly. The intention was also to get an opinion of average phonetic and phonological competence of this group of prelingually profoundly deaf children, with pure tone averages between 90-108 dB at .5, 1 and 2 kHz.

1. INTRODUCTION

Prelingually deaf children do not acquire speech spontaneously. They have to learn oral speech through visual information mainly and to rely on orosensorymotor control in maintaining speech movements. As the deaf child does not have any acoustic speech target to compare his own production with, his speech will be characterised by specific deviations and substitutions due to input limitations in speech perception such as auditory limitations and limited visibility of phonetic features and impacts of orthography and insufficient physiological control.

Despite the fact that prelingually deaf children have difficulties in producing normally articulated and auditorily acceptable speech some studies have reported that they can develop a phonological system through the limited information available, [2], [4], [5], [6], [8]. However, these systems will differ in some respects to those of normally hearing children.

Through a phonological assessment it can be determined to which extent an inadequate phonological system is obscured by phonetic deviations and the systematic deviant patterns can be identified. A detailed phonetic transcription, that describes the phonetic inventory and its application in different word positions, should form the basis of the phonological assessment.

In a study by Öster [6], it was shown that a deviant pronunciation in fact was an attempt to express a speech sound contrast. A child made a contrast between voiced and unvoiced bilabial stops but not through voicing. Instead the contrast was expressed by lip-protrusion in initial position and by the insertion of a neutral vowel in final positions. The training was then directed towards changing this inadequate way of expressing voicing contrast to improve the intelligibility of the child's speech.

A traditionally phonetic analysis describes the quality of a child's articulation of various speech sounds with no reference to their distinctive function in spoken language. Often distortions, substitutions and omissions are listed that show what the child is not capable of articulating. The sounds that the child articulates correctly are disregarded. Even if a child knows how to articulate a speech sound correctly, this does not imply that the usage is correct in his spoken language. Through a phonological assessment, on the other hand, it is possible to study systematic deviations in spoken language, of those speech sounds, which a child has shown to be capable of articulating. If these systematic deviations can be explained by limited phoneme perception in lip-reading, impact of orthography or insufficient physiological control valuable pedagogical information is obtained.

2. AIM OF THE STUDY

The intention was to investigate how phonetic deviations affect the phonological systems of deaf children. Assessments were made to establish which speech sounds most of the children could articulate, which of these sounds were applied correctly in their speech and what the substitutions and other deviations looked like.

3. SUBJECTS, PROCEDURES AND SPEECH MATERIAL

Eleven prelingually deaf children, educated by sign-language, participated in the study. One child was eleven years of age, while the others ranged from fourteen to seventeen years. Their pure tone averages were between 90-108 dB at .5, 1 and 2 kHz. The intelligibility of their speech varied from very poor to very good.

The children read a list of familiar words provided with stimulus pictures. The word list contained all Swedish consonants, which occurred at least twice in initial, medial and final position, if phonotactically possible. The videorecorded speech was given a narrow phonetic transcription, using the symbols of IPA and some additional diacritics. Some of those which Bush, Edwards, Luckau, Stoel, Macken and Petersen [1], Grunwell [3] and Roug, Landberg and Lundberg [7] have developed for the transcription of babbling and phonetic development in early infancy were used to transcribe those sounds in the speech of the deaf, which are not part of the IPA inventory. The phonetic inventory and phone distribution in the different word positions was established.

4. RESULT AND DISCUSSION

Figure 1 shows the number of children who, at least once in the material, controlled the articulation of each Swedish consonant correctly. The figure also shows the number of children who made correct use of their articulation in initial, medial and final word positions. In other words, the difference in heights between the two bars, representing each consonant, shows the number of children, who made phonological substitutions or deviations in some position. A big difference indicates that this speech sound is difficult for a deaf child to control in this position, for example /ʃ/. Five children could articulate that sound but no one controlled it in initial position, only three in medial position and four in final position. The types of deviations or substitutions observed in various positions are shown in figure 2, where it can be seen that a stop or fricatives produced at incorrect places of articulation were substituted for /ʃ/ in initial position.

The children controlled 70% of the articulation of Swedish consonants on the average but they could only make use of 43% of them in initial position, 50% in medial position and 50% in final position, which is shown in figure 1. This indicates a discrepancy between the children's phonetic and phonological competence. Some speech sounds, however, are in correspondence like /t/ in initial position, /p/ and /m/ in medial position and /ŋ/ in final position.

The influence of the visibility of articulation on speech acquisition of deaf children is obvious since those speech sounds that most of the children control are the unvoiced bilabial and dental stop, the unvoiced labiodental fricative and the lateral, which are all visually contrastive and easy to lip-read.

Figure 2 shows all deviant phonetypes in various positions of systematic deviations occurred for those speech sounds that the subjects could articulate correctly at least once in the speech material. Some of them probably represent different phonemes despite the phonetic similarity . For example, it can be assumed, despite the phonetic similarity to [b], that a child could make contrasts between /p/, /b/ and /m/ in initial position through lip-protrusion for /p/, devoicing for /b/ and voicing for /m/. Another child makes perhaps contrasts between /t/, /d/ and /n/ in final position, despite the phonetic similarity to [d], through a non-audible release, devoicing and through nasal air emission.

In Swedish /ɕ/ can be spelled as *tj, kj, k* or *ch* and /ʃ/ can be spelled as *sk, sch, sj, skj* and *ch*. The fact that two, and sometimes three, graphemes are pronounced as one sound is probably not obvious to some children. The impact of

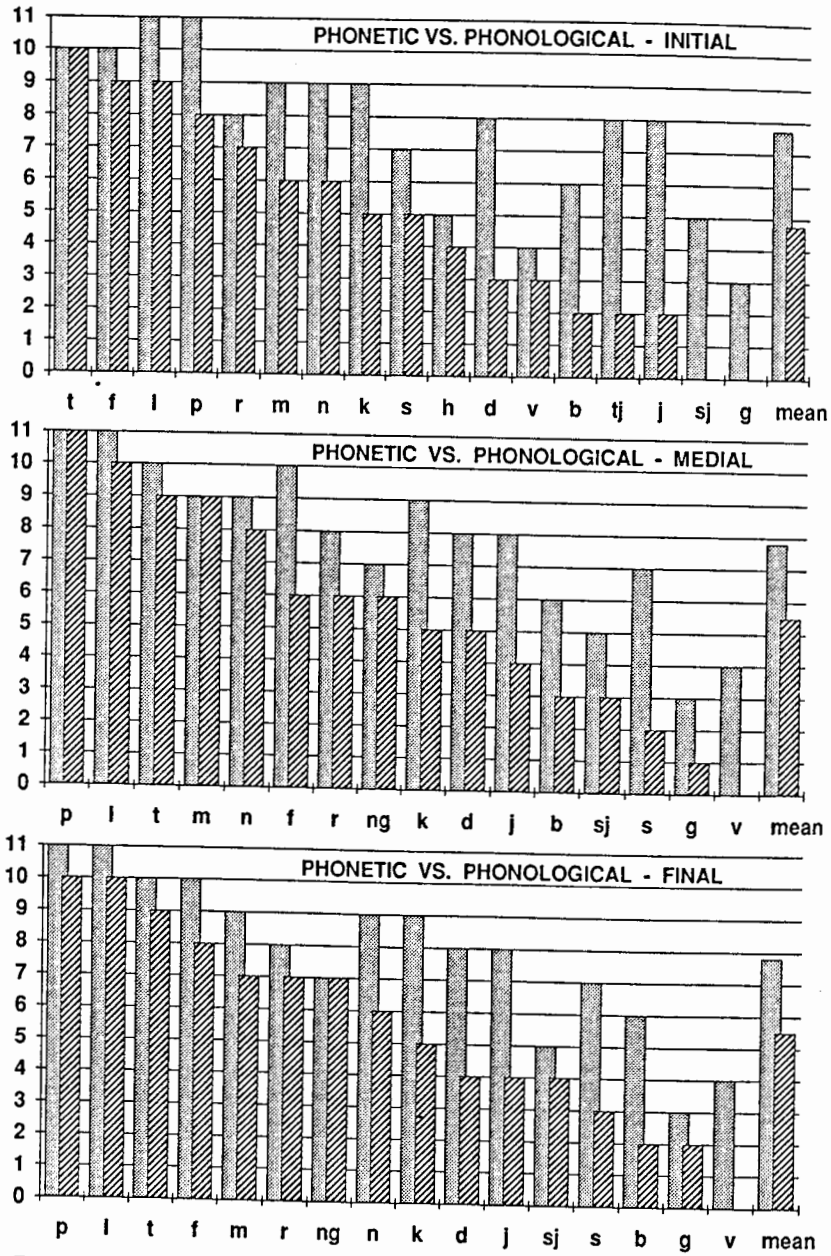

Figure 1. The number of children, who could articulate each consonant correctly at least once (▩ phonetic competence) and, who made correct use of their articulation in spoken language (▨ phonological competence) is shown in initial, medial and final word position. sj denotes /ʃ/, ng /ŋ/ and tj /ç/.

orthography can to some extent explain the deviations found for /ʃ/ and /ç/.

The fact that /s/, /ʃ/ and /ç/ are confused can also be due to incorrect physiological control. The cause can be that the air-flow is too weak and that the constriction is formed in an inaccurate way or produced at an inaccurate place.

	INITIAL	MEDIAL	FINAL
p	b̲,b,m		p̆
b	b̥,p	b̥	b̥,p
m	b,b̥		ᵐb,b
f	v	v,vᴷ	vᴷ
v	v̥	v̥,v̥ᴷ	v̥,v̥ᴷ
t		d	dˀ
d	d̥,t,l	t,n	d̥,g,n
n	d,d̥	d	d,d̥,d̃
l	r,d̥,ɳ	ɳ	m
r	l	l,ɬ	l,ɳ
s	ç,t,d	ç,ʃ,t	ç,n,ʃ
ç	k,t,tj,j,ts	N/A	N/A
j	ç,s,ɸ,i:	ŋ,n,ç	ŋ,n,ç,s
ʃ	k,s,ç	k,ç	k
k	g	g,x	g,k̥,ɸ
g	g̊,k,ɸ	g̊	g̊
ŋ	N/A	nj	
h	ɸ	N/A	N/A

Figure 2. Systematic deviations in different word-positions for the speech sounds that the children could articulate at least once in the speech material.
N/A = not applicable in this position. For an explanation of the diacritics, see reference [1], [3] and [7].

5. FINAL REMARKS

To assess the speech of deaf children phonologically is extremely important since valuable pedagogical information about systematical phonological deviations of speech sounds, which a child controls the articulation of, can be derived. By this means further development of deviant processes can be avoided during the speech acquisition of deaf children.

5. ACKNOWLEDGMENTS

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