DEVELOPMENT OF PHONOLOGICAL OPPOSITION VOWEL/CONSONANT WITH NORMAL CHILDREN AND CHILDREN WITH ANARTHRIA

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ABSTRACT

The difference in the development of speech sounds with normal children and children with anarthria is revealed at the babbling stage. In this period normal children's vocalizations exhibit "syllable-likes" in which we can find segments with max-contrast and min-contrast between vocal and consonant elements.

By contrast to a normal child a child with anarthria is capable of producing only mid-contrast segments. This proves that mid-contrast syllable-likes are stipulated by the functioning of the speech mechanism, but production of max-contrast units is the major requisition for establishing the first phonological opposition: vowel/consonant.

The phonological system of the patient is destroyed on the level of speech production but is kept intact on the level of speech perception. This means that there are the two systems of distinctive features: one of them is connected with speech production while the other - with speech perception.

INTRODUCTION

Most authors writing on language acquisition and analysing the pre-speech stage of normal speech development discuss their data in such linguistic terms as phonemes (vowel and consonant), prosodic features etc. |1|. It seems to be more correct if we analyse these facts in terms of "syllable-like", "vowel-like", "consonant-like", because such vocalizations neither motorically, nor functionally are speech sounds and even less so-phonemes. Vowel-likes and consonant-likes are examined here within the syllable-likes, since, according to N.I. Žinkin's data, it is the syllable which is actually the unit of speech production |2|, and at the pre-speech stage it is respectively, the syllable-like.
The purpose of this investigation is to compare data of normal development (pre-speech stage) and data of anarthria since this comparison may be helpful in revealing some typological features of language as such and, in particular, they can throw light on the process, preceding formation of phonological oppositions.

THE METHOD OF INVESTIGATION AND THE MATERIAL

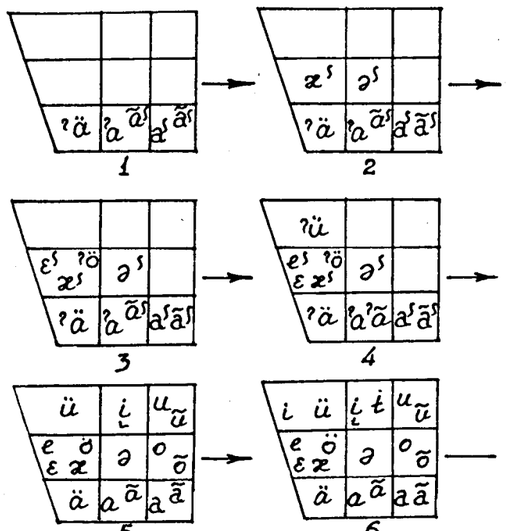
For the purpose of this investigation the pre-speech stage has been divided into some sub-stages, i.e.: crying (0-0.2); cooing (0.2-0.4); pre-babbling (0.4-0.6) and babbling as such (0.6-1.1). We have studied vocalizations of 38 normal babies from 0.3-0.10 and vocalizations of one child with anarthria who was 7 years old. All these vocalizations have been recorded and then treated by the oscillograph and separator. The majority of the normal children remained under observation for a period of some months; others were observed at certain points of their life (for instance, at the age of 3 or 8 months etc.). The patient with anarthria was under close observation for more than a year. For the purpose of the our investigation of the patient's vocalizations we worked out some special experiments. We asked the patient to analyse the sound structure of words like |pâpa|, |tâta|, |tʳôtʳa|, |hudôi|, |balʲsôi| using alphabet; to repeat definite types of the syllables given by the examiner |pa|, |pʲi|, |nʲe|, |du|, |bo|, |nʲi|, |mu|, |o|, |u|, |i|, |a|, |ma|. The patient's vocalizations when he was alone with his toys were also recorded.
In his case anarthria appeared as a result of the birth trauma. The patient's central nervous system abnormality implicates the basic mechanism of speech synergism. The neurological and psychological examinations showed that the child had an inborn disability of coordinating the muscles of the vocal tract and of producing intelligible speech |3|. His pronunciation was similar vocalizations of children at the cooing and pre-babbling stages. But at the same time he had normal hearing and could understand spoken language but there could be no question of his understanding Russian completely. He could cry and laugh, and it sounded normal. He was able to make short coughlike grunts to accompany his pantomimed communications. His cognitive and communicative activity was very high, but his general knowledge is below the norm for his age.

THE RESULTS AND THEIR DISCUSSION

Vowel-likes inside syllable-likes |V|. Our material allows us to describe the acquisition of vowel-likes at the pre-speech stage in normal and pathological development (see Table 1). Table 1 shows that the first to appear are vocalizations producing the impression of mid vowel-likes of non-high. From the point of view of articulation these vocalizations are the simplest: the mouth opens widely, the posi-

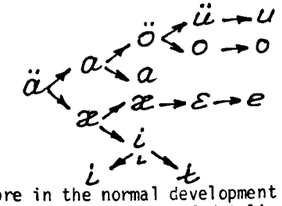
Table 1

The Normal Development of Vowel-Likes at the Pre-Speech Stage (from cooing to babbling).



~ - nazalization; .. - moving forward;
˽ - moving backward.

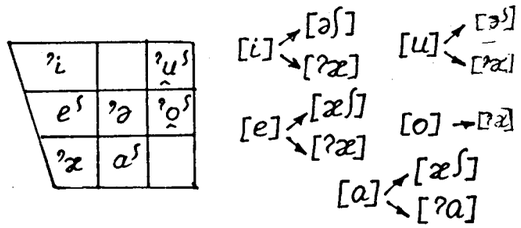
tion of the tongue is neutral, the muscular strain is minimal, the vocal bands are weakening.
In the course of child's development the speech organs are perfected and this gives him an opportunity to produce not only mid vowel-likes but sounds which are more narrow and front, like |ɛ|. The intensity of such vocalizations is smaller, but the muscular strain is greater. We also observed the tendency to smooth the marginal positions of the tongue. For instance, in the development of |u| and |o| we observed the movement of the tongue forward to |ü| and |ö|; in the development of |i| and |e| the tendency of drawing the tongue off and down and the appearance the vowel-like |ä|.
In the development of phonetic field of vowels one can observe the gradual differentiation of vowel-likes and the appearance of the connection between the production of sounds and its acoustic form.



Therefore in the normal development the acquiring of vowels is the process of detalization and differentiation of the initial mid vocalizations.
In the patient's vocalizations some other types of vowel-likes may be found (see Table 2).

Table 2

The System of the Patient's Vocalizations



a) Patient's babbling; b) The repetition of the syllables |V| given by the examiner.

Table 2 shows that babbling vocalizations have a greater variety than vocalizations in his repetition. It means that the patient has some difficulties in bringing his voicing mechanism under voluntary control.
In the repetition there are substitutions of vowels, and the general tendency is to produce mid vowel-likes without any differentiations. Labialized vowels like |o|, |u| were substituted by mid partly labialized |o̜|, |u̜|. Such acoustic features as loudness, timbre and duration were not stable. The most difficult task for the patient was to produce vowel-likes with high F_1, which need for their articulation efficient differentiations.
Analysing Tables 1 and 2 we found out that in vocalizations of normal children at the cooing and pre-babbling stages and in the vocalizations of the patient vowel-like sounds are accompanied by noisy on and off glides, glottal stop |ʔ| or voiceless indistinct mid sound |S|.
Consonant-likes inside syllable-likes |CV|. The first consonant-likes appear in normal development at the cooing stage. We can point out in children's sounds as well as in the patient's vocalizations the presence of partly voiced and moderatly palatalized consonant-likes. In addition in the patient repetition of syllables |ta|, |tʲa|, |bʲi|, |nʲu|, |po| we see the regular substitutions of the first consonant component with |w| or |j|. Most of consonant-likes as well as vowel-likes receive additional nasal articulation, and are accompanied by the vocal on and off glides |S̃a|.
All these facts can be explained from the physiological point of view: the epiglottis is high, pharyngal modulations are minimal |4|. For children it is impossible to mantain a fixed position of their speech organs, and as a result their articulation is gliding. In normal children's vocalizations in contrast to our patient, there are many consonant-likes - they greatly exceed those in the speech of adults, surrounding the baby. At this period in vocalizations of Russian children, for instance, it is possible to find sounds like clicks. Normal children vocalizations have no connection with adult speech. This is the so-called pre-phonemic level.
In normal and pathological vocalizations max- and min-contrast syllable-likes are absent because con-

sonantal elements are accompanied by the vocal on and off glides and vocal elements - by the noisy glottal stop or the voiceless indistinct sound. This results in the increased sonority in the first case and reduced sonority in the second |5|.

$$C^{V} \longleftrightarrow {}^{C}V$$

It determines the absence of coarticulation between consonantal and vocal elements inside such syllable-likes. The appearance of max-contrast syllable-likes is impossible.

There is a similarity in vocal-consonantal vocalizations between normal babies at the cooing and pre-babbling stages and the patient with anarthria. The divergence in the acquisition of vowels and consonants in normal and pathological development begins at the babbling stage.

At this stage in normal acquisition the epiglottis is descending. This is the physiological requisition for the articulatory oppositions of sounds. Changes of the speech mechanism and its connection with perception of adult's speech (echolalia) are the basis for the formation of phonological oppositions as such. In normal development in contrast to anarthria we can observe the tendency in vowel and cosonant-likes of loosing their noisy and vocal on and off glides, glottal stop. The articulation becomes even more differentiated. As a result in normal development max-contrast syllables like |*pa*|, |*ta*| appear. Therefore the presence of max-contrast syllable-likes in babies vocalizations is the major requisition for the opposition of sounds according to degrees of sonority, when on the one hand there are wide non-high vowels like |*a*|, but on the other one there are voiceless stop consonants like |*p*|, |*t*|. This is a manifestation of the first general phonological opposition: vowel/consonant.

This opposition is the earliest in child development and is a universal one since according to R. Jakobson, it is observed in all the languages of the world |6|.

This opposition is absent in the patient's speech production but is present in his speech perception.

At the end of the pre-babbling stage in normal development it is possible to distinguish sounds according to the types of resonators (mouth resonator - nose cavity). As a result, we can find oral and nasal vowel- and consonant-likes. This distinction in the resonator's types is the physiological requisition for the forming at the babbling stage of the phonological opposition: oral/nasal.

Then babies begin to split both consonantal and vocal components and other differentiations oppositions also appear.

CONCLUSION

At the cooing and pre-babbling stages in normal development and with our patient we find vocalizations in which features of articulation contrasts are mixed up. As a result, the appearance of max-contrast syllables is impossible.

The same was established by N.I. Žinkin in the sound system of hamadryads. He pointed out that in their vocalizations combinations of a vocal element with a noisy consonant-likes do not occur; only combinations of a vocal element with a sonant-like are possible |4|.

The perfection of the speech mechanism and its connection with the children's perception of adult speech brings forth the appearance of max-contrast syllables, which in its turn stimulates the formation of the first general opposition: vowel/consonant. Various other oppositions modifying and attenuating the primary contrast of consonant and vowel follow.

The dominating influence of adults' speech on the acquisition of the phonological oppositions is proved by the presence of such oppositions in the patients' speech perception, but their absence in his speech production. This fact shows that until a certain moment the absence of speech production skills doesn't interfere with a more or less adequate understanding of speech.

These results may be used for patients' rehabilitation and in language teaching.

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