

PERCEPTUAL FACTORS IN PHONOLOGY*

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1. INTRODUCTION

In this paper I will discuss a type of phonological processes that cannot be predicted by the articulatorily based feature system of Chomsky and Halle. It will be shown that there is not always a one-to-one relation between articulation and perception. Consequently, both articulatory and perceptual factors must be considered in the construction of feature systems.

2. NATURALNESS

The measure of naturalness offered by Chomsky and Halle is a feature-counting procedure — the fewer the features involved, the more natural the class or process.

This evaluation procedure is not only considered a tool for the linguist when choosing between competing grammars, but it is also claimed to operate when a child is learning his native tongue (Chomsky and Halle 1968 : 251): "It is on the basis of this evaluation measure that a child learning a language chooses one of the grammars (of which there are, in principle, infinitely many) compatible with the fairly restricted body of linguistic data to which he has been exposed."

3. ARTICULATORY REINTERPRETATION

Each child, when learning his native tongue, has to construct his own grammar on the basis of scattered and degraded linguistic data. The primary data available are auditory stimuli, which are given articulatory interpretations by the child. During this process there is a possibility for the child to make an articulatory reinterpretation of perceptually similar segments. Suppose that a given language uses a segment whose phonetic realisation is [t]. In this particular case, there is more than one articu-

* Read by Björn Lindblom.

latory configuration that will produce an acoustic and perceptual pattern similar to that associated with the velarized lateral of the mature speakers. It is for instance possible to use a labio-velar [w] instead. Figure 1 shows spectrograms of the nonsense words [iwi] and [iti] as spoken by a phonetically-trained Swedish speaker. It can be seen that the consonantal portions as well as the transitional patterns are closely similar. It does not seem unjustified to assume that in cases of this sort, that is, in cases of perceptual similarity and articulatory ambiguity, it is more likely than otherwise that the child reinterprets the articulatory characteristics of speech sounds.

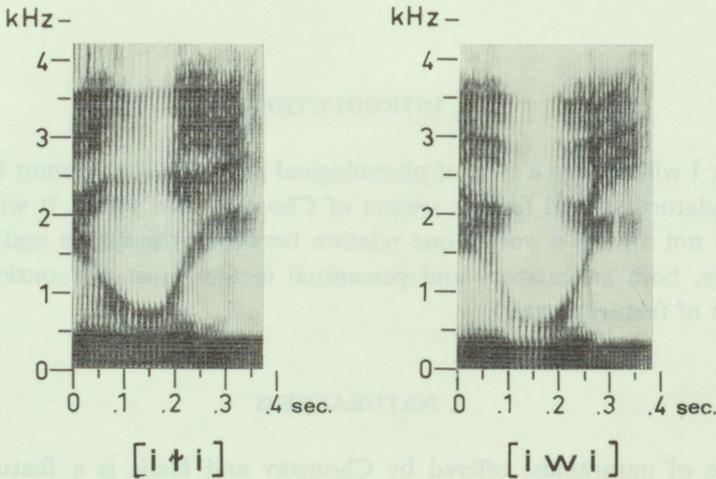


Fig. 1.

4. AN EXAMPLE OF ARTICULATORY REINTERPRETATION

In Polish there has been a change from a velarized lateral [ɫ] to a labiovelar semi-vowel [w]. In terms of the Chomsky and Halle framework, we get the following rule Figure 2:

$$\begin{bmatrix} + \text{voc} \\ + \text{cons} \\ + \text{cor} \\ + \text{ant} \\ + \text{lat} \\ - \text{round} \end{bmatrix} \rightarrow \begin{bmatrix} - \text{voc} \\ - \text{cons} \\ - \text{cor} \\ - \text{ant} \\ - \text{lat} \\ + \text{round} \end{bmatrix} / \begin{bmatrix} + \text{cont} \\ + \text{high} \\ + \text{back} \end{bmatrix}$$

Fig. 2.

Assuming an evaluation procedure based on feature counting, we would have to regard this change as highly improbable. We know, however, that this change is very

common. It has been reported by Leopold and Moskowitz for English child language and it has occurred in the diachronical development of English and French as well.

Other similar examples are offered by Jonasson (1971), where nasals versus plosives, the feature of stridency, different /r/ sounds and the perceptual affinity of [p] and [k] as opposed to [t], are treated.

5. CONCLUSION

The preceding discussion suggests that certain phonological processes and classes stem from perceptual factors and will not be predicted nor easily described in a purely articulatory system. So both articulation and perception contribute to the shaping of phonological structure. Consequently both aspects must be included in a distinctive feature system.

6. RESEARCH PROSPECTS

It has been shown that articulation and perception in different ways contribute to phonological structures. But there are more links in the speech communication chain. If observed phonological structures are considered to be the result of successive 'bottle-necks' in the communication chain, it is reasonable to assume that the construction of models for the different links in this chain must contribute to our understanding of phonological phenomena and human language in general. It can be speculated that such a study might cause the disappearance of the traditional distinctive feature approach in phonology in favor of numerical models.

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DISCUSSION

BOND (Columbus, Ohio)

Could you elaborate on how you propose to specify perceptual similarity?

LINDBLOM

I think that the specification that Jonasson has in mind is to be based on a perceptual representation of the physical 'space' of phonetic segments. So far some preliminary attempts have been made by our research group to develop such a measure of perceptual similarity for vowels.

PADDOCK (Wolfville, N.S.)

I would like to support Jonasson's claim that some of Jakobson's proposed distinctive features may be superior to their Chomsky and Halle replacements. In particular, I have proposed discrete perceptual correlates for all three of Jakobson's oral resonance (i.e., vocalic) dimensions (i.e., sharp-flat, acute-grave, compact-diffuse). See my paper in *Lingua* 25 (1970):142-151, for details.