Mechanisms of stop consonant production

Lindqvist-Gauffin, J. and Lubker, J.

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I. SPEECH PRODUCTION

A. MECHANISMS OF STOP CONSONANT PRODUCTION

J. Lindeqvist and J. Lubker*

Those speech sounds which are described by their manner of production as stops have generated a considerable amount of research interest for a number of years. It has been a common practice to categorize the stops linguistically as being voiced or voiceless. Such categorization implies that some stops are produced with audible vibration of the vocal folds (/bdg/), while for others (/ptk/), the vocal folds do not vibrate.

Although the above categorization may have some linguistic merit it is inefficient when used at the production or acoustic levels of the speech act. For example, it is well known that the vocal folds do not vibrate under all conditions of /bdg/ production. Nevertheless, much effort has been directed toward attempting to define production and acoustic parameters which correspond to the voiced-voiceless dichotomy. Several reasons may account for such efforts having been less than successful:

(a) Much of the previous research has attempted to define the stops as being physiologically/acoustically voiced-voiceless, or physiologically/acoustically tense-lax, or physiologically/acoustically aspirated-unaspirated. It is not necessary to discuss here the variety of technical means used to attempt such physiologic and acoustic definitions. The point to be made is, it is very likely not correct to consider the stops as voiced-voiceless or tense-lax or aspirated-unaspirated, but rather, these three sets must be taken together to realistically and adequately define the stops, see also Kim (1965); Fischer-Jørgensen (1968); and Fant (1966, 1969).

(b) Most research has attempted to define and categorize the stops of a given language, thereby at least implying that the definitions and categorizations of the stops are language dependent. It is likely that the opposite is true, i.e., physiologic and acoustic parameters which serve to categorize and define stops in one language may not suffice

* Guest researcher at the Dept. of Speech Communication from 24.2.70.
in another, e.g. Fischer-Jørgensen (1968); Slis and Cohen (1969). That is, the production and acoustic characteristics of stops are probably strongly language dependent.

(c) Much of the work reported on stops does not take into account the effects of the position of the stop and the stress of the adjacent vowels. Such parameters not only effect stop characteristics within a given language, but may be expected to have differential effects across languages.

If, indeed, the above arguments are valid, it is clear that future research should be directed towards the interaction of the several possible physiologic-acoustic parameters, to the variability in the importance of these parameters and their interactions across languages, and to the effects of variations in position and stress.

It is with this in mind that we have begun to explore the mechanisms of stop production. At present our plan is to direct our efforts along several lines. First we will review the data of previous research, our own as well as that of others, which have been concerned with the acoustic and/or physiologic parameters of stop production in various languages. In this review we will seek physiologic and acoustic consistencies as well as inconsistencies in stop categorization within and across languages. Secondly, we will obtain acoustic and physiologic data on Swedish and English stop productions. The acoustic data will consist of spectrograms and mingograms (duplex and oscillographic recordings, intensity registration, and frequency registration), while the physiologic data will be primarily fiber-optic and glottographic examinations of laryngeal function. Finally, we will attempt a general model of the mechanisms of stop production, to the extent that such a model is appropriate across languages, and consider variations in the model necessary to account for some specific languages .... primarily Swedish and English.

References:


