

RESEARCH ON THE PHYSIOLOGICAL CORRELATE TO THE TWO VOWEL TYPES
IN GERMAN.

W. W. Schuhmacher

The occurrence versus non-occurrence in open and closed syllable divides the category of the German vowels into two classes: one type occurring both in open and closed syllable, and another type occurring in closed syllable only. The purpose of the research reported here is to find the physiological correlate to these two types, our hypothesis being that the functional criterion has some physiological counterpart.

The vocoids manifesting the two vowel types have often been defined as "tense" and "lax". The two attributes should then refer to different degrees of tongue tension, in accordance with the traditional conception dating back to Bell's and Sweet's opposition "narrow - wide".

A pilot study was carried out to verify or falsify Ernst A. Meyer's conclusion from 1913 that "bei den gespannten vokalen eine stärkere pressung der stimmbänder und ein verhältnismässig geringerer atemverbrauch stattfindet als bei den ungespannten vokalen" (1). We recorded sub- and supraglottal air pressure and oral air flow (plus the oscillogram from a throat microphone) on a 4-channel Mingo-graph during a subject's articulation of the 15 German vowels. The vowels were pronounced in the following consonantal environments: /l-l/, /v-l/, /g-l/, /l-k/, /b-t/. In our laboratory setup sub- and supraglottal air pressure are at present picked up by means of manometers of the type manufactured in Edinburgh. Each manometer is connected to a rubber tube which is passed through the nose: one tube goes into the pharynx, the other - with a balloon at the end - in the oesophagus, i.e. the subglottal air pressure is measured indirectly according to Ladefoged's method. The mean air flow is measured by means of the flow meter (aerometer) constructed by Svend Smith and Børge Frøkjær-Jensen.

On the basis of 150 recordings (each vowel pronounced 10 times by the author) the following preliminary results can be stated:

Our experiments verify Meyer's result in that we have found a difference in the mean air flow ($1 \frac{1}{3}$ times higher for the lax vocoids manifesting the vowels occurring only in closed syllable - a slightly

lower figure compared with Meyer's 1 1/2 times higher ratio), and no difference in the subglottal pressure. On the other hand, the tense vocoids (manifesting the vowels occurring both in open and closed syllable) are characterized by the supraglottal pressure being 1 1/2 times higher than that for the other vocoids. As the tense type is characterized by a higher supraglottal air pressure and a lower mean air flow at the lips, we must assume a greater resistance somewhere in the vocal tract in between.

In order to investigate a possible correlation between mean air flow and abduction-adduction of the vocal cords Fabre's glottographic method was also tried in a brief experiment. The morphology of these glottograms is, however, complicated as we are far from knowing exactly what we measure (see this report, p.22ff). Measurements by means of the type of glottograph recording the amount of light passing through the glottis from a light source are planned.

As possible future methods one might think of the application of radio-isotopes in order to get information about the air passing through the glottis, and of high-speed cineradiographic technique.

References:

- (1) Ernst A. Meyer, "Zum Problem der Vokalspannung", Die neueren Sprachen (1913), pp. 65-86, 145-171.