VOICE QUALITY AND INDEXICAL INFORMATION

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ABSTRACT

The outline of a componential descriptive model of voice quality is suggested, in the hope of facilitating discussion about voice quality among phoneticians, linguists, speech therapists, psychologists and psychiatrists. Emphasis is laid on the function of voice quality as an index to biological, psychological and social characteristics of the speaker.

INTRODUCTION

As actors in a social world, we interact with other people by virtue of a constant interchange of information on many different levels. Perhaps the most explicit sort of information exchanged in social intercourse is language, and modern linguistic and phonetic theory has developed some elegant and effective concepts for the description of speech, the spoken medium of language. The description of the more narrowly linguistic aspects of speech does not, however, exhaust the possibilities of information carried in utterances. Any given utterance contains not only linguistic information, but also a great deal of information for the listener about the characteristics of the speaker himself. Abercrombie (1967) refers to the features in speech which convey this information as ‘indexical’ features. It is the purpose of this article to explore one major vehicle of such indexical information in speech, that of voice quality.

While the concepts available for linguistic description are well developed, it is only comparatively recently that phoneticians have begun to show more than a cursory interest in a descriptive theory of voice quality. For a long time other disciplines such as speech pathology, psychology and psychiatry have been more ready to acknowledge the relevance of the study of this topic. With the current expansion of research in the area, this may be an appropriate time to try to suggest the broad outline of an overall descriptive model of voice quality. One motive for attempting to set up such a descriptive model is to facilitate interdisciplinary discussion of the indexical function of voice quality; another is to incorporate the descriptive model into the wider theory of general phonetics. I hope to be able to show that general phonetics constitutes a legitimate framework for the study of this area, in that it offers an appropriate philosophy of analysis, and can make available an established and meaningful body of relevant descriptive concepts.

There has been a variety of usages in labelling voice qualities in the past. With the exception of some phonetically sophisticated systems developed by speech pathology, the majority of previous systems have used single impressionistic labels for given voice qualities. Typical labels have been “husky”, “plummy”, “thin”, “rich”, “velvety”, “reedy”, etcetera. Such labels are often vague to the point of meaninglessness, except in a metaphorical sense, or as arbitrary imitation-labels. The great advantage of a general phonetic approach to the labelling problem is that, in its systems for describing the physiology of articulation, overall labelling is not attempted. The basic philosophy of phonetic analysis is that composite articulatory
events are broken down into their component parts, and each independent physiological component is separately labelled. Thus, for example, the sound at the beginning of the English word 'fat' is described not as a 'sort of "f"-sound', but as a 'pulmonic, egressive, voiceless, labiodental fricative with velic closure', with each important physiological component analytically isolated.

It is the principal thesis of the descriptive model put forward here that voice quality is similarly susceptible of description in terms of components, and that general phonetic theory can supply the concepts necessary for a physiologically meaningful description of each of the components.1

OUTLINE OF A DESCRIPTIVE MODEL OF VOICE QUALITY

Voice quality, the quasi-permanent quality of a speaker's voice (Abercrombie, 1967, p. 91), can be thought of as deriving from two main sources: firstly, the anatomical and physiological foundation of a speaker's vocal equipment; and secondly, the long-term muscular adjustments, or 'settings' (Honikman, 1964), once acquired idiosyncratically, or by social imitation, and now unconscious, of the speaker's larynx and supralaryngeal vocal tract.

The anatomy and physiology of a speaker determine the width of the potential range of operation for any voice quality feature, and the long-term habitual settings of the larynx and the vocal tract restrict this feature to a more limited range of operation. For example, a man's voice may be physically capable of spanning a wide pitch range; in normal speech, however, he habitually selects a more restricted range within the total possibilities. Basic anatomy and physiology thus determine the possible extremes, and voluntary muscular settings determine habitual ranges between those extremes.

While factors of basic anatomy and physiology are beyond the speaker's control, and the habitual settings are to a certain extent within his control, both these sources of voice quality can transmit indexical information, although of different sorts, as we shall see in a later section.

The anatomy and physiology of the vocal organs, and their habitual muscular settings, are all of legitimate professional interest to the phonetician, but for the moment the habitual muscular settings will be taken as the more direct focus of attention.

It is useful to divide the settings into two groups:

A. Settings of the larynx
B. Settings of the supralaryngeal vocal tract

A. SETTINGs OF THE LARYNX

Laryngeal settings fall into three sub-categories:

(a) phonation types
(b) pitch ranges
(c) loudness ranges

(a) Phonation Types. Phonation types constitute an area which is still largely open to exploration. Certainly, some labels exist, and are used more or less widely in phonetics, but much research needs to be done before confident statements

1 Abercrombie (1967), Garvin and Ladefoged (1963) and Fairbanks (1960) are among previous writers who have suggested a phonetic approach to voice quality. This article owes much, in particular, to Abercrombie's suggestions.
about the detailed physiology of a wide range of phonation types can be made. The phonation types relevant to this article about whose physiology something is known, besides 'normal voice', include 'breathy voice', 'whispery voice', 'creaky voice', 'falsetto voice', 'ventricular voice' and 'harsh voice'. One of the most valuable contributions to current phonetic knowledge about phonation types has been that of Catford (1964), and he has done much to give both physiological and aerodynamic definitions to many of the above labels.

Some combinations of these phonation types are possible, as in 'harsh, whispey voice', 'whispery, ventricular voice', 'creaky, falsetto voice', 'harsh, falsetto voice', 'harsh, whispey, falsetto voice', 'whispery, creaky voice', 'breathy, falsetto voice' and so forth. (See Catford, 1964.)

(b) Pitch Ranges. Pitch ranges within the total possible range in any phonation type can usefully be described on a five-point scale: 'very deep', 'deep', 'medium', 'high', and 'very high'.

Although the total pitch-possibilities for each phonation type can be divided into the five suggested ranges, there seems to be a tendency for speakers using a given phonation type to favour a particular pitch range. This happens, for instance, in the case of falsetto voice, where speakers typically select a high pitch range within the possibilities for falsetto voice, or in creaky voice, where the deeper ranges for creaky voice are often used. In acoustic terms, the absolute frequencies involved in deep falsetto voice and high creaky voice (which show less usual choices of pitch range within the possibilities for the particular phonation types), may overlap considerably. The 'normal voice' phonation type does not show this tendency quite as much as the other phonation types, and the pitch ranges used are much more varied.

(c) Loudness Ranges. Loudness ranges can also be described as selections from a five-point scale: 'very soft', 'soft', 'medium', 'loud' and 'very loud'.

The habitual settings of the laryngeal and associated musculature which result in characteristic pitch and loudness ranges are of a different order from the settings for characteristic phonation types, in that while a person might be recognized solely by his phonation type in the utterance of a single syllable, a much longer stretch of utterance would be necessary for a listener to be able to recognize the speaker by his characteristic pitch and loudness ranges. However, partly because impressionistic labels for voice quality nearly always seem to contain an implicit reference to these features, and partly because of the quasi-permanent role of such features in characterising the speaker, pitch and loudness ranges are included in this outline model as features integrally associated with the overall quality of a speaker's voice. In a theoretically more rigorous analysis one would abstract such 'dynamic' features separately from features of 'quality' (Abercrombie, 1967, Ch. 6).

B. SETTINGS OF THE SUPRALARYNGEAL VOCAL TRACT

Supralaryngeal settings of the vocal tract can be divided into four groups, referring to different sorts of modification of the shape and acoustic characteristics of the tract:

(a) longitudinal modifications
(b) latitudinal modifications
(c) tension modifications
(d) nasalisation
(a) **Longitudinal Modifications.** Longitudinal modifications of the vocal tract can result from vertical displacements of the larynx upwards or downwards, from a neutral position, to give 'raised larynx voice' or 'lowered larynx voice'. Pouting forwards of the lips also effects changes in the length of the longitudinal axis of the vocal tract, and has auditory and acoustic correlates in voice quality.

(b) **Latitudinal Modifications.** Latitudinal modifications of the vocal tract involve quasi-permanent changes in the cross-sectional area at a particular location of the tract, which result in local constrictive or expansive tendencies. These modifications include: different sorts of labialisation, with the space between the lips being narrowed either vertically or horizontally, or both; two types of pharyngalisation, involving muscular constrictions of the pharynx, or in narrowing of the pharynx by backward displacement of the tongue from its central position in the mouth; and thirdly, settings of the tongue that result in a constrictive or expansive tendency somewhere in the oral cavity.

The settings of the tongue in the oral and pharyngeal cavity are parallel to many of the 'secondary articulations' of traditional phonetic theory. One could speak of overall tendencies towards maintaining a particular 'secondary articulation', but of course such settings are in no sense 'secondary' as far as voice quality, as distinct from segmental features, is concerned (Abercrombie 1967, p. 93). A less prejudicial conceptualisation of the general principle underlying these settings of the tongue, whether in the mouth or in the pharynx, is achieved if any local constrictive or expansive tendency is thought of as resulting from a shift, along one or both of the horizontal and vertical axes of the mouth, of the centre of gravity of the tongue away from the neutral position in which it would lie in an unmodified vocal tract. In this way, pharyngalisation can be said to result from backing in the mouth of the centre of gravity of the tongue; velarisation from backing and raising; palatalisation from raising; alveolarisation from fronting; and a quality which currently lacks a conventional phonetic term, but which is sometimes impressionistically called "hot potato voice", as if the speaker literally had a hot object in his mouth, is the result of lowering, and perhaps backing, of the centre of gravity of the tongue.

For convenience in the labelling system, instead of the more cumbersome 'tongue-raised-and-backed voice', et cetera, the more usual phonetic labels such as 'velarised voice' can be retained, provided that it is remembered that no implications of secondary status enter their definition, which would be in terms of the relative position of the centre of gravity of the tongue.

It is probable, because the tongue is of a relatively fixed volume, that any constrictive tendency in the mouth has a corresponding compensatory expansive tendency in other parts of the mouth and pharynx. Similarly, some longitudinal modifications of the vocal tract probably involve a latitudinal component as well; raised larynx voice, for example, has a component of slight pharyngalisation. It is also probable that longitudinal modifications involving vertical displacements of the larynx and oral and pharyngeal latitudinal modifications of the vocal tract can affect the fine detail of the mode of vibration of the vocal cords within any phonation type, because of the interactions of the different muscle systems involved.

(c) **Tension Modifications.** In a detailed model of voice quality, account would have to be taken of the effect of variations in the degree of overall muscular tension of the vocal organs on the acoustic damping characteristics of the vocal tract, through factors of radiation and absorption of sound energy in the tract walls. Different degrees of muscular tension may contribute importantly, for
example, to the auditory differences between the qualities of the impressionistically-labelled "metallic voice" and "muffled voice". More research is needed in this area, and factors of overall muscular tension will be omitted from further discussion in this article.

(d) Nasalisation. It is customary, in phonetic usage in this area, to distinguish only between 'nasalised voice' and 'denasalised voice'. In a more detailed model, it would perhaps be necessary to re-scrutinize these two categories, and set up some finer sub-divisions. Speech pathology, for example, has shown that there are a number of auditorily distinguishable kinds of nasalisation arising from a variety of organic causes (Luchsinger and Arnold, 1965). Similarly, the term 'denasalised voice' seems to cover at least two different phenomena: firstly, a quality resulting from habitual velic closure, or, more accurately, from a complete lack of nasal resonance; secondly, the quality which is produced by a speaker with a severe cold in the head and nasal catarrh. The first can legitimately be called 'denasalised voice'; the second, speculatively, might be better thought of as a special case of 'nasalised voice', resulting from a partial or complete blockage of catarrhal mucus somewhere in the nasal cavity or nasopharyngeal sphincter, which would allow the cavity to resonate, but in a highly damped manner. An auditory quality rather like that of velarisation seems also to be a component of such 'cold-in-the-head' voices, perhaps because of some feature of muscular adjustment in the vocal tract walls near the soft palate in this special condition.

In this exploratory article, such sub-divisions will be ignored, and the terms 'nasalised voice' and 'denasalised voice' used in the customary phonetic sense mentioned above.

Features of habitual nasalisation may conceivably affect the setting of the vocal tract as a whole, and thereby the laryngeal settings also; this is because some of the depressor-relaxer muscles of the velum, glossopalatinus and pharyngopalatinus (Kaplan, 1960, p. 188), which serve to open the velic valve, have their point of origin in the tongue and pharynx, and these muscles, to be effective, have to exert a pull, in contraction, against their points of origin.

The use of a quantitative scale is helpful when describing supralaryngeal modifications of the vocal tract. At least, three degrees of modification can usually be auditorily distinguished—'slight', 'moderate', and 'severe'. Thus one may choose to refer to 'slightly pharyngalised voice', 'severely nasalised voice', 'moderately raised larynx voice', and so on.

Labelling System for Voice Quality

We are now in a position to offer more specific comments on the suggested labelling system. Instead of single-term impressionistic labels such as "beery", "brassy", "sepulchral", et cetera, we can use composite labels made up of a number of phonetic terms, each specifying a physiologically meaningful component of the voice quality in question. The labelling system concentrates, as a beginning to the problem, on the voluntary muscular settings rather than on the limitations imposed by the basic anatomy and physiology which underlie the settings.

As a convention, features of pitch range and loudness range are described first, then features of supralaryngeal modification, and lastly features of phonation type. Typical labels might then be 'deep, loud, nasalised, harsh voice', 'high, soft, velarised, raised larynx, falsetto voice', 'very soft, nasalised, whispy, creaky voice',

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'very high, pharyngalised, harsh, falsetto voice', 'deep, nasalised voice', and so forth.

Medium pitch, medium loudness, an unmodified vocal tract, and the ‘normal voice’ phonation type can be left to be assumed if no contrary specification is explicitly made. Scalar quantities of different degrees of vocal tract modification can be incorporated, as in ‘high, loud, severely nasalised voice’, or ‘deep, soft, slightly velarised, whispery, creaky voice’. If the degree of vocal tract modification is left unspecified, it could be assumed that a moderate degree was applicable.

It becomes possible to communicate fairly reliably about voices, with a phonetically meaningful descriptive system of this sort. The translation of some impressionistic labels can be attempted, and some illustrative examples are suggested in the following list:

**Equivalence of Labelling Systems**

<table>
<thead>
<tr>
<th>Impressionistic Label</th>
<th>Phonetic Label</th>
</tr>
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<tbody>
<tr>
<td>Ginny voice</td>
<td>High, (harsh), whispery, creaky voice</td>
</tr>
<tr>
<td>Husky voice</td>
<td>Deep, soft, whispery voice</td>
</tr>
<tr>
<td>Golden voice</td>
<td>Deep, soft, slightly nasalised voice</td>
</tr>
<tr>
<td>Piping voice</td>
<td>High, falsetto voice</td>
</tr>
<tr>
<td>Bleating voice</td>
<td>High, loud, (severely) nasalised voice</td>
</tr>
<tr>
<td>Light blue voice</td>
<td>High, soft, raised larynx voice</td>
</tr>
<tr>
<td>Hoarse voice</td>
<td>Deep, (loud), harsh/ventricular, whispery voice</td>
</tr>
<tr>
<td>Gruff voice</td>
<td>Deep, harsh, whispery, creaky voice</td>
</tr>
<tr>
<td>Sepulchral voice</td>
<td>Very deep, pharyngalised, tongue-lowered,</td>
</tr>
<tr>
<td></td>
<td>lowered larynx, (whispery), (creaky) voice</td>
</tr>
<tr>
<td>Adenoidal voice</td>
<td>Soft, denasalised, velarised voice</td>
</tr>
</tbody>
</table>

Because of the unreliability of reference of the impressionistic labels, not everyone might agree with the suggested translations, but at least the phonetic system, while not yet offering a complete specification, does allow positive statements to be made about assumed components. Communication in writing about voice qualities becomes much more feasible, because the phonetic labels in effect convey instructions for attempts at imitation of the voluntarily controllable components referred to.

**Indexical Information in Voice Quality**

The descriptive model of voice quality put forward here can now facilitate the discussion of the sources of indexical information in voice quality; the information falls broadly into three categories:

A. Biological information
B. Psychological information
C. Social information

**A. Biological Information in Voice Quality.** Biological information about the speaker, derived from the effects, outside his control, of his anatomy and physiology, itself falls into three sub-categories:

(a) size and physique
(b) sex and age
(c) medical state

(a) Size and Physique.—There seems to be a general correlation between a person’s size and physique and the size of his larynx and vocal tract. If we hear a
very deep loud voice over the telephone, we confidently expect the speaker to turn out to be a large strong male; and in general our expectations are fulfilled, within fairly wide margins of error (Moses, 1941, Fay and Middleton, 1940a). Exceptions to this rule are not uncommon, but they take one aback when they occur.

(b) Sex and Age.—One usually forms fairly accurate impressions, from voice quality alone, of a speaker's sex and age (Mysak, 1959, Tarneaud, 1941, Zerffi, 1957). Deviations from 'normal' expectations about the correlation between a speaker's voice and his sex and age seem to have a powerful effect on impressions of personality.

(c) Medical State.—Voice quality supplies a surprisingly varied amount of indexical information about the medical state of the speaker. It is useful to distinguish between permanent and slightly more ephemeral, although still relatively long-term, medical states. Information about permanent aspects can include details of general health, with crude correlations between, for instance, phonaesthenia, or soft, whispy/breathy voices, and poor health, and between so-called “strong”, “resonant”, or “rich” voices, (deep, loud, (nasalised) voices), and good health. Permanent abnormalities of anatomy and physiology can be revealed by voice qualities associated with cleft palates, deafness, and even exceptional singing voices, which are sufficiently rare to be thought abnormal in this sense.

More ephemeral, but still quasi-permanent states of health can be signalled by voice quality when the speaker is suffering from conditions of local inflammation of his vocal organs, as in laryngitis, pharyngitis, and tonsillitis, and from nasal catarrh, adenoids or a cold.

Other ephemeral factors in voice quality derive from changes in the hormonal state of the speaker, where, for example, these result in changes in the copiousness and consistency of the supply of lubricating mucus to the larynx, and in the characteristics of the mucous membrane covering the actual vocal cords. Such changes occur in the pregnant and premenstrual states in women (Perello, 1962), and in conditions of sexual arousal in both men and women. These changes often seem to cause slight harshness, and whispery or breathy voice.

Clues in voice quality to other more permanent, but occasionally reversible, hormonal states are sometimes found in the case of voice disorders resulting from diseases of the thyroid, adrenal, and pituitary glands (Luchsinger and Arnold, 1965). Systematic research into the possible use of voice quality as a diagnostic index to these and other medical states would be extremely valuable; so far, the area has only sporadically attracted investigation (McCallum, 1954; Palmer, 1956; Punt, 1959; Sonninen, 1960; Canter, 1963).

Examples of temporary states which can become more permanent, and which can be detected in voice quality, are the effects of intoxicating agents like alcohol and tobacco smoke. In excess, these agents tend to damage the vocal cords. “Whisky voice”, “ginny voice”, and “rummy voice” are popular labels for the deep, harsh, whispy voices that tend to signal one result of excessive habitual consumption of alcohol (Luchsinger and Arnold, 1965) and “smoker’s larynx” is a fairly frequently used medical label for the pathological effect of excessive tobacco smoke on the vocal cords (Myerson, 1950; Devine, 1960).

Lastly, information about temporary states such as fatigue can sometimes be found in voice quality.

B. Psychological Information in Voice Quality. We seem to be prepared, as listeners, to draw quite far-reaching conclusions from voice quality about long-term psychological characteristics of a speaker, in assessments of personality. In
Western culture, we are ready to believe, for example, that a harsh voice is correlated with more aggressive, dominant, authoritative characteristics, and a breathy voice with more self-effacing, submissive, meek personalities. The belief that personality characteristics, both normal and psychopathological, are correlated with voice quality, has been tested experimentally by many writers, mainly in the medical and psychological fields (Allport and Cantril, 1934; Cohen, 1961; Diehl, White and Burle, 1959; Eisenberg and Zalowitz, 1938; Fay and Middleton, 1939b, 1940b; Froeschels, 1960; Goldfarb, Braunstein and Lorge, 1956; Mallory and Miller, 1958; Moore, 1939; Moses, 1954; Pear, 1957; Sapir, 1926-27; Starkweather, 1964; Taylor, 1934). Some controversy remains, but in general writers seem to agree that some such broad correlations do exist. Intuitively, one would agree with them, but one major obstacle in the way of reliable scientific statements has been the lack of any standard system of labelling the voice qualities concerned, and a related inability to attain more than a fairly crude quantification of the voice quality variables which act as the experimental stimuli.

If it is true that information about personality is conveyed by voice quality, then the information must be chiefly carried by aspects of the habitual muscular settings, rather than by the basically invariant anatomy and physiology of the speaker.

C. Social Information in Voice Quality. Social behaviour is largely learned behaviour. Because of this, clues in voice quality to social information must lie mainly in those features of voice quality which can be acquired by imitation. In this sense, a particular accent often has a special voice quality associated with it, and the voice quality can thereby act as a partial clue to any social characteristics that are typical of speakers of that accent. Thus voice quality may serve as an index to features of regional origin, social status, social values and attitudes, and profession or occupation, where these features characterise speakers of the particular accent in question. Nasalisation is a voice quality component very commonly associated with particular accents. It characterises most speakers of Received Pronunciation in England, and many accents of the United States and Australia. Velarisation is a regional marker in the speech of speakers from Liverpool and Birmingham, England, and some parts of New York.

Voice quality can also act as an index to membership of a group which is not necessarily an accent-group (Fay and Middleton, 1939a). For example, some British male stage actors used to seem consciously to strive to attain a voice quality like that of Sir Laurence Olivier; similarly, military drill sergeants typically have harsh voices, and these are not necessarily the result of habitual vocal abuse, but rather acquired by imitation, in the hope of projecting the characteristic persona of their profession.

STEREOTYPED JUDGEMENTS IN VOICE QUALITY

We all act, as listeners, as if we were experts in using information in voice quality to reach conclusions about biological, psychological and social characteristics of speakers. Long experience of inferring such characteristics from voice quality, presumably often successfully confirmed by information from other levels, invests our implicit ideas about the correlations between voice quality and indexical information with an imagined infallibility. It is worth questioning the validity of this judgement process. We make judgements, and we act on them, but is the information we infer accurate, or is there a possibility that it is quite false? Since the correlations
must be statistical in nature, and not always of a very high degree of statistical confidence, obviously listeners will sometimes be wrong in the conclusions they draw from particular voice qualities. There is a good deal of evidence that in such subjective judgements we operate with stereotypes (Cantril and Allport, 1935; Eisenberg and Zalowitz, 1938; Fay and Middleton, 1939b, 1940a, 1940b; Starkweather, 1964). Listeners, if they are from the same culture, tend to reach the same indexical conclusions from the same evidence, but the conclusions themselves may, on occasion, bear no reliable relation to the real characteristics of the speaker.

Of the three types of indexical information in voice quality, biological, psychological, and social, it is the biological information which probably tends to lead to the most accurate conclusions, especially as to sex and age. Biological conclusions are possibly more reliable because of the fact that they derive principally from the involuntary, largely invariant aspects of a speaker’s anatomy and physiology. Psychological and social conclusions are much more likely to be erroneous, because of their culturally relative nature, and because they derive from a more variable strand of the speaker’s voice quality, the habitual muscular settings of the larynx and vocal tract.

**EXPERIMENTAL INVESTIGATION OF VOICE QUALITY**

The descriptive model suggested in this article represents no more than an initial structuring of the area, and a good deal of work, both experimental and theoretical, will be necessary before the phonetic description of voice quality can approach adequacy. Happily, experimental phonetics is not lacking in appropriate techniques of investigation. Experimental research can follow two complementary lines of approach, in speech analysis and speech synthesis.

In the speech analysis approach to voice quality, data are needed on a number of different aspects. It would be valuable, for instance, to have anthropometric measurements of typical variations in anatomical dimensions, as well as acoustic and physiological information about long-term articulatory activity. Acoustic techniques currently available include a wide range of analytic devices, from spectrography for discovering the distribution in time and frequency of acoustic energy, to inverse filtering of the speech signal for recovery of the characteristics of the glottal waveform. Physiological techniques which might be utilised include cineradiography, stroboscopic cinélaminography (Hollien, 1964), electromanometry, and electromyography (Cooper, 1965).

Speech synthesis is a useful avenue of research, in that hypotheses about physiological activities and their acoustic and auditory correlates can be easily tested. It is particularly valuable in that voice qualities of narrowly defined specifications can be fairly precisely simulated (Wendahl, 1963; Laver, 1967), and psycho phonetic perceptual tests and the training of judges in the phonetic labelling system can be correspondingly facilitated.

**THE RELEVANCE OF VOICE QUALITY FOR THE DISCIPLINES CONCERNED WITH SPEECH**

I have maintained that while it is the business of general phonetics to suggest a descriptive model of voice quality, the study of this area has relevance for a number of disciplines.

Speech pathology has a direct interest in voice quality, and various systems of descriptive terminology are used by workers in this field. These systems, moreover, are not necessarily lacking in implications of phonetic specificity, as in the use of
terms like 'hyperrhinolalia' and 'hyperrhinophonia' as labels for 'severely nasalised voice', and 'dysphonia plicae ventricularis', for 'ventricular voice'. The limitation of such systems is in their emphasis on deviations, for whatever etiological reasons, from socially acceptable norms of voice quality. This is not to disparage such systems; in many areas of speech pathology attention is necessarily focused on abnormality. However, such systems are inherently too partial for general applicability to voice qualities of all kinds. The advantage of the more general type of system outlined in this article is in its being able to function without prejudice as to culturally-assessed factors of 'normality' or 'abnormality'. Both sorts of systems share the characteristic of analysing voice quality on a physiological, componential basis. Either system would be valuable, for instance, in the research area commented on earlier, that of the use of the voice as an indexical diagnostic clue to various pathological states.

Psychology and psychiatry have shown a frequent interest in voice quality research, because of the importance of the voice as an index to affective conditions, and to personality. Psychological experimentation in this area might benefit considerably from the techniques of synthetic simulation of voice qualities mentioned earlier, in that the voice quality stimulus variable in experiments investigating the correlations between voice quality and personality, for example, might be brought under more delicate, reliable and quantified control in this way.

Finally, considerations of voice quality are crucial for some aspects of the specifically linguistic study of speech. The distinction between voice quality and 'phonetic quality' is one of the most fundamental distinctions in linguistic phonetics (Ladefoged, 1962), since phonetic quality is the basic datum of the subject, in its capacity as the vehicle for the meaningful distinctions of phonology. It is sometimes thought that phonetic quality and voice quality are independent aspects of the phonic continuum, and that therefore phonetic quality can be related directly, as a simple abstraction, to the 'real world' of 'phonic quality'. A case can nevertheless be made for considering that phonetic quality and voice quality are not completely independent, and that phonetic quality can in fact only be judged against the previously assessed background of the voice quality of the speaker producing the utterance. Phonetic quality in this view would thus be a more abstract concept than is perhaps often believed.

One of the difficulties facing phoneticians and linguists investigating the phonology of a particular language arises from the general fact that voice quality and phonetic quality can rely for their manifestation on many similar activities of the speech organs. Activities used on a quasi-permanent basis, in some of the habitual laryngeal and supralaryngeal settings, can potentially also be used, on a much shorter-term basis, in the contrastive articulations representing phonological units.

Thus many of the features discussed in this article in their rôle as contributors to voice quality, such as labialisation, palatalisation, velarisation, pharyngalisation, nasality, breathy voice, and creaky voice, have also been found in various languages as signals used to differentiate the phonetic quality of the sounds representing phonological units in those languages.

It is because of the potential linguistic utilization of such features that the phonetician or linguist conducting phonological research must take an early decision about the status of these features, when they occur in the speech of his informant.
VOICE QUALITY AND INDEXICAL INFORMATION

CONCLUSION

The study of speech attracts the research attention of a number of different disciplines, each with its own professional interests. For the majority of these disciplines speech is a partial interest, and the main focus of the discipline lies outside speech as such, as in the case of psychology and psychiatry. Speech therapy, on the other hand, takes speech as its principal data, but brings a specialised interest to bear on a restricted area within the wider field of speech as a whole. The one subject which takes as its professional domain the study of all aspects of speech is phonetics. As such, phonetics should be able to offer, to these other interested disciplines, comprehensive theoretical structures for the description of all aspects of speech. This article has outlined a general phonetic approach to the description of voice quality, as one particular aspect of speech, in the hope of facilitating interdisciplinary discussion about this aspect, and about the indexical information conveyed by its different factors.

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