

A NEW APPROACH TO THE CLASSIFICATION OF VOICE DISORDERS

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Almost all branches of science are afflicted with a certain amount of ambiguity, inappropriateness and duplication in the use of terms for which Speech Pathology is not exception. In Speech Pathology, perhaps no other branch is afflicted more with this ambiguity in the usage of terms than the field of voice. Much of this semantic confusion in the field of voice is the heritage of pre-scientific ear when singers and singing teachers tried to describe what they felt when they sang and what they thought was actually happening (Broadnitz, 1959). Many of these terms that they coined are still in use and in doing so perhaps we are thinking in wrong concepts.

The importance of definitions in science is too well known. For any communication to occur there must be a common language, that is, the speaker and the listener must have words and/or gestures with an agreed meaning. One cannot proceed further without defining his terms because in science the definitions are the most fundamental phenomenon of the condition under study. The precision of the phenomenon will be determined by the specificity of the definition. In fact, these definitions serve as the basis for further study of the condition under question. At present, it is difficult to find a 'comprehensive' definition of 'normal voice'; these definitions are not comprehensive because they are subjective and hence confusing.

We shall now see how the definitions of normality and abnormality of voice have been full of ambiguous expressions and misconceptions. West, *et al.*, (1957) offer the following criteria for normal voice: adequate loudness, clearness of the tone, pitch appropriate to the age and sex, a slight vibration and a graceful and constant inflection of pitch and force which follows the meaning of what is spoken. Further, they state that any departure from these norms should be considered abnormal. It is evident that these criteria are subjective as it is difficult to get agreement on such terms as 'adequate', 'clearness', 'appropriateness', 'slight', 'graceful' and others. What is the level of loudness and clearness of tone that constitute normality of voice and what should be the extent of deviation from this normality before voice can be termed abnormal? They confuse the issue further by bringing 'meaning' into picture. How the meaning of spoken words distorts the normality of voice and how it is to be judged is left to anybody's imagination. Berry and Eisenson (1956) and Van Riper and Irwin (1966) propose similar criteria to judge the normality of voice and they are open

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to the same criticism as the definition of West, *et d.*, (1957). Van Riper and Irwin (1966) state that 'voice can vary widely with respect to pitch, loudness and quality without appearing abnormal and the concept of normal voice may be related to cultural preferences age and sex as well as to social and economic status'. The criteria offered by Van Riper and Irwin (1966) are so vague and general that they not only hamper the task of drawing a distinction between normal and abnormal voice but also leave the clinician wondering not knowing whether there is an entity called abnormal voice. Further, with so many variables which are not easily controllable and with so many terms on which interpersonal agreement cannot be reached, the application of Van Riper and Irwin's (1966) criteria to determine the normality of voice cannot be justified.

We shall see how this ambiguity in the usage of terms has percolated to the classification of voice disorders. It is common to hear Speech Pathologists referring to a person as having harsh voice, hoarse voice, etc., but very distressing is the fact that there is frequently a lack of agreement as to when a person is considered as having harsh voice or hoarse voice. It is quite apparent that this uncertainty tends to increase the clinician's bias. And the classification of voice disorders based on these definitions are certainly bound to augment the problem. The question of normality and abnormality of voice being a matter of subjective opinion, consequently most of the classificatory systems of voice and its disorders have been rendered ambiguous. A more serious problem of this ambiguity would be that a clinician tends to think that he knows everything about the condition under study because that word is familiar to him. And thus, the clinician fails to understand the physiology of normal and abnormal voice production.

Voice disorders have been classified by many (Frcescheles, 1940; Broadnitz, 1959; Berry and Eisenson, 1962; Greene, 1964; Murphy, 1964; Mysak, 1966; Sokoloff, 1966; Van Riper and Irwin, 1966; Laver, 1969; Boone, 1971 and Paul Moore, 1972). One of the purposes of this paper is to critically examine some of these classifications.

Mysak (1966) classifies voice disorders into the following categories.

1. Phonatory and resonatory disorders of infraglottal origin.
2. Phonatory and resonatory disorders of glottal origin.
3. Phonatory and resonatory disorders of supraglottal origin.

Under the first category, Mysak includes the problem of vocal weakness which according to him is caused by inadequate sub-glottic air pressure. Vocal cord paralysis, vocal nodules and laryngectomy are included in the second category while complexes associated with deficits of velopharyngeal closure find a place in the last category.

Sokoloff (1966) has given a classification of voice disorders which includes the following categories:

1. Phonatory problems due to hyperfunction
2. Phonatory problems due to hypofunction ,
3. Phonatory problems due to abnormal resonance (Supraglottal cavities)

The first category includes harsh and hoarse voice, pitch disorders, the second category breathiness, hysterical aphonia, etc., while the last category includes hypo and hypernasality. A similar classification of hypo and hypertension has also been employed by Froescheles (1940), Broadnitz (1959) and Boone (1971).

Mysak (1966) recognizes only organic voice problems while on the other hand, Sokoloff (1966) recognizes only functional voice problems. By functional voice disorders, Sokoloff refers to those problems which are related to a deviation from normal in terms of usage of the vocal mechanism as distinguished from disturbances of structure or innervation.

We find that the problem of nasality is an organic problem to Mysak while it is a functional problem to Sokoloff. Pitch disorders is a functional problem to Sokoloff while the problem of loudness which is so much related to pitch is an organic problem to Mysak. We know that voice quality is dependent on the resonance of the vocal tract (Judson and Weaver, 1965). However, harsh and hoarse voices which have been considered as deviations of voice quality, in the literature do not find a place under the phonatory problems due to abnormal resonance in the above classifications. These classifications give a clear-cut distinctions between pitch and loudness disorders.

We know that pitch, loudness and quality are all interrelated and a change in one implies a re-adjustment in the dynamics of the other two. This being the case, we are not really justified in talking of isolated disorders of pitch, loudness or any of the deviations of voice quality.) In this connection a quote from Perkins (1971) is pertinent: 'no isolated aspect of voice will be affected such as pitch or intensity alone....either it is produced correctly in each aspect or the total production is faulty'. Hence our concern should be with the whole voice in all its aspects and not with isolated disorders of any of its deviations.

Froescheles (1940) recognizes phonatory problems of hyper function. The description he has given for some of the conditions are confusing. For example, hoarseness is supposed to be the combination of breathy and harsh voice qualities and harsh voice quality is characterized by extreme loudness and strident quality of the vocal tone. Further, he says hoarseness can be caused by phonation of the ventricular bands or it may even be a product of faulty learning. It is not known in what sense Froescheles has included all these conditions under the functional problems under which he also discusses a number of other conditions (such as endrocrinal dysfunctions); The therapy techniques include psychotherapy, relaxation and chewing method (Froescheles, 1952) and they are the same for both phonatory problems of hyper and hypo function. Though Froescheles (1940) has given 7 categories of voice problems based on hyper function, he does not give any technique by which one can find out the site and extent of the tension.

The diagnosis of hyper function and hypo function based on only the resultant voice overlooking the physical system will be misleading. Even Broadnitz (1962) refers to the observable acoustic symptoms rather than to *a*. specific anatomical location in his description of the hypo versus hyper function categories. Also these classificatory systems do not take into consideration the fact that it is difficult to differentiate between phonatory and resonatory disorders of voice. As the resonators have a damping influence on the generators (Judson and Weaver, 1965), it becomes difficult to isolate the phonatory problems from the resonatory problems and vice versa, particularly when taking into consideration only the resultant voice.

The above classifications are based neither on the etiology nor on the therapeutic procedures to be employed. They are not even descriptive. In any classification the definition of any group must hold precisely true of each and every member of that group and must not hold true of the members of any other group. It is confusing to find vocal weakness under both phonatory and resonatory problems of infraglottal and supraglottal origin in Mysak's (1966) classification. Hence, it can be said that these classificatory systems do not fulfil the rigorous criteria of a scientifically effective classification.

A classification based on etiology has been employed by many (Paul Moore, 1972; Van Riper and Irwin, 1966 and Murphy, 1964). The problems which are heard as abnormal pitch, intensity or quality are directly related to the mechanisms of the respiratory tract and to their associated structures. When voice disorders are present, it means that the vocal cords or the resonators are not functioning normally. Voice defects may result from the way the individual has learned to use the vocal mechanism in which case they are known as functional problems: or they may stem directly from growths, diseases, loss of tissue, structural anomalies, etc., in which case, they are considered organic problems.

There is a wide agreement that this traditional medical distinction between functional and organic disorders of voice can be confusing to the Speech Pathologist (Perkins, 1971) whose responsibility is to correct deviant vocal behaviour. It has also been accepted that this distinction between functional and organic voice problem is not always easy to draw and always feasible (Sokoloff, 1966). In fact Sokoloff (1966) recommends that these two diagnostic categories be considered as extremes of a continuum of vocal dysfunctions.

An example would clearly show why a distinction between organic and functional voice problem is not always feasible and can be confusing to the Speech Pathologists. There are many research reports which say that vocal nodules cause hoarseness by changing the mode and rate of vibration of the vocal cords (Leden, *et al.*, 1960 and Rubin and Lehrhoff, 1962) and similarly a change in the mode and rate of vibration of the vocal cords has been accused of causing vocal nodules (Wilson, 1961). But unfortunately it has not been possible to determine whether hoarseness causes vocal nodules or vice versa. Also Williamson (1946) states that hoarseness is generally a product of faulty learning while Freud (1962) holds

that hoarseness is associated with phonation with the ventricular bands. Since vocal therapy is the recommended course of treatment in both the cases and a good amount of improvement can be achieved with this (Broadnitz, 1963 and Williamson, 1946), it does not matter whether hoarseness is a functional voice problem or an organic problem. Hence, this classification based on etiology loses its relevance.

Another most frequently used classification of voice disorder is based on the three attributes of voice, viz., pitch, loudness and quality. All these concepts depend on the subjective judgement of listeners and they being highly interdependent (Perkins, 1971) differentiation between them is neither justifiable nor it is easy. Quality is dependent on fundamental frequency and harmonics, mode of vibration of the vocal cords and the resonators. Any change in these factors would certainly bring about a change in the quality of voice (perceivable or non-perceivable). Similarly, loudness which is dependent on subglottic air pressure, resonance and other factors would also bring about a change in the quality when any of these factors are changed. Further, both quality and loudness are dependent on the frequency of vibration. Pitch is the subjective auditory impression of the frequency of the sound and it has been shown that pitch varies along with frequency and intensity when intensity and frequency respectively are held constant (Fletcher, 1958). We know these things from the study of pure tones and not much is known about the relation of pitch with frequency and intensity in complex tones. However, periodicity of pitch has been found to be important in the perception of pitch in complex tones (Plomp, 1967). Hence, to use the term pitch to describe voice is subjective. There is no reference level against which one can measure it to label it as normal or abnormal. This being the case with pitch and loudness, any description of voice quality would be more ambiguous. Added to these is the problem of terminology. Terminology has played havoc in the description of voice qualities. According to Murphy (1964) they are described by 'a language of metaphor'. Hence any classificatory system which views pitch, loudness and quality as separate is bound to be misleading.

Thus we see that none of these classificatory systems fulfil the rigorous criteria of a scientifically effective classification. They neither give a description of the various voice problems in unequivocal terms nor help in the rehabilitation of the patients afflicted with these problems. A review of the etiology of the voice disorders, therapies and classificatory systems of voice disorders shows that the therapies advocated for these problems are neither based on the classificatory system nor the etiology. For example, as noted earlier, Froescheles (1952) advocates psychotherapy, chewing method and relaxation exercises for both phonatory and resonatory disorders of hypo and hyper junction, irrespective of the etiology. Thus we come to the inescapable conclusion that these classificatory systems do not serve any purpose.

New approach for the classification of voice disorders

Most of the therapies of voice disorders are based on the assumption that each individual has an optimum pitch at which the voice will be of good quality and will have maximum intensity with least expense of energy. Most of the therapies aim to alter the habitual pitch level of the patients or make the patient to use his optimum pitch (Cowan, 1936; Strother, 1946; West, *et al.*, 1957; Thurman, 1958; Anderson, 1961; Greene, 1964; Murphy, 1964; Van Riper and Irwin, 1966). It is apparent that irrespective of the 'label and causes' the clinician is training the patient to use his optimum frequency (which is subjectively termed optimum pitch) mainly by altering his habitual pitch on the assumption that this would result in 'good' voice. The characteristic of optimum pitch suggests that if the patient is trained to use his optimum pitch it will result in good voice. As said earlier, for the development of a comprehensive classification of voice disorders, a distinction between normal and abnormal voice is a pre-requisite. Here we propose to define 'normal' voice operationally—the 'good' voice is one which has optimum frequency as its fundamental (habitual) frequency'. Further, we propose that from the therapeutic point of view, there is no need for a classification of voice disorders except classifying the voice into normal and abnormal categories. This can be achieved objectively by comparing the habitual fundamental frequency and optimum frequency of the individual.

There are several objective methods of finding fundamental frequency (Stroboscope, Spectrograph, etc.) and optimum frequency (Nataraja, 1972). Further, Shantha (1973) has shown that it is possible to achieve 'good' voice by training the patient to use his optimum frequency." She has demonstrated this with patients having 'hoarseness', 'nasality', 'breathiness', 'puberphonia', 'spastic dysphonia', 'high pitch due to hearing loss', 'hysterical aphonia', 'vocal cord paralysis' etc. She also reported that she was not able to achieve 'socially acceptable esthetic' voices with two patients having 'hoarseness' even when they were trained to use their optimum frequencies. The reasons for this failure are not known. Whether they can be attributed to the method of treatment or to the system itself, one can say only with further research. We are justified to follow this procedure as long as the assumptions made about optimum pitch are correct. Most of the times 'maximum realization of the acoustical and esthetic goals is achieved when voice is produced efficiently, therefore effortlessly, therefore hygienically' (Perkins, 1971). It has been shown that there will be maximum physio-acoustic economy at the level of the optimum frequency (Shashikala, 1979). We must remember that the Speech Pathologists' responsibility is to correct the deviant vocal behaviour (Perkins, 1971) and not to give 'socially acceptable esthetic' voices.

As noted earlier, the therapist may not be able to give 'socially acceptable esthetic' voices to some patients even when they are trained to use their optimum frequencies. This may be the limitation of that individual himself. For example, it may not be possible to achieve the 'socially acceptable esthetic' voices with

patients afflicted with vocal cord paralysis. Under such situations, it becomes the responsibility of the Speech Pathologist to educate the individual and the society to accept this voice as it is hygienic to the vocal mechanism of that particular individual. The greatest advantage of training the patient to use his optimum frequency is that it results in optimal vocal balance and efficiency.

It must also be remembered that by training the patient to use his optimum frequency, the clinician is trying to give him the 'best' voice and not just the 'average' voice. In the words of Perkins (1971)—'the specification of optimal function is different from the specification of the normal. Optimum is best, normal is average'. It is evident that normal speakers do not employ their optimum frequency (George Samuel, 1973). Thus the clinician by giving the optimum frequency to the patient makes him to use the best voice which is hygienic to his vocal mechanism.

It is possible to objectively categorize voice into normal and abnormal categories by taking optimum frequency as the criterion. It is possible to treat a number of vocal disorders, irrespective of 'labels and causes' by training the patient to use his optimum frequency. The authors are also aware that it may not be possible to describe all voice disorders, particularly those of voice 'quality' based only on the optimum frequency. We need to take into consideration other parameters as stated by Michael and Wendal (1971). However, unless more rigorous and objective criteria are followed to categorize voice into normal and abnormal categories and unless differential therapies are standardized for different vocal problems with different etiologies, it seems to the authors that the classification of voice proposed here is sufficient for an objective classification of normal and abnormal voice.

An attempt at an objective method for differential diagnosis of dysphonia has been made by Jayaram (1975). He has measured optimum frequency, habitual frequency, mean air flow rate, vital capacity, frequency range, SPL range and phonation duration in normals and various types of dysphonics. He has found profiles for each kind of dysphonia. He has concluded that it would be possible to differentially diagnose voice disorders based on objective measurements of parameters of voice. Thus it would be possible to classify the voice disorders more precisely and objectively. More studies are going on in this direction with the hope that these will help in developing more objective and simpler therapy techniques.

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