

A DESCRIPTION OF CERTAIN PHONETIC TENDENCIES AS ETIOLOGICAL FACTORS IN FUNCTIONAL VOICE DISORDERS

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The following description of certain phonetic tendencies¹ as etiological factors in functional dysphonia emerges as the result of many years of clinical specialization in voice disorders in a university speech and hearing clinic.² For this presentation, two major phonetic tendencies, perceived most frequently on vocalic forms, have been chosen; namely, the tendency toward *raising*³ and *tensing* and, conversely, the tendency toward *backing*⁴ and *tensing*. The term FUNCTIONAL, for practical reasons, is used to include those voice disorders in which functionally-based tissue change has occurred (Brodnitz 1965).

The phonetic tendency toward raising and tensing is perceived quite often in American English on the front vowel phonemes /i, I, e, æ/, the first elements of the diphthongal forms /aI, aU/ and the glide-vowel combination /ju/ (Lawrence 1970a). An over-contraction of articulatory muscles is noted which, in turn, has a muscular hypertensive effect upon other portions of the vocal tract as well as distorting one or more of the physiological parameters of vowel production (Black and Irwin 1969) from the phonemic optimum. More specifically, on phonemes /i, I, e/, when the raising phenomenon occurs, the blade of the tongue assumes an overly tensed, raised positioning with too-tight contact of the sides of the blade with the inner portion of the molars as far forward as the incisors on specific occurrences. The lips may be unduly spread and retracted, thus exciting excessive muscular contraction in the lip areas and in the buccal tract. When raising occurs upon phonemic /æ/ and upon the first element of the diphthongal form /aU/, the dorsum of the tongue is noticeably raised and overly tensed, frequently with appreciable retraction of the body and tip of the tongue. Likewise, on the raised /aI, aU/ forms, the lips are retracted in varying degrees

¹ "Certain articulatory and structural tendencies" (Malmberg 1963) are operant within each phonetic system.

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³ "A vowel is said to be raised when it is made with the tongue arched higher than is typical for that sound, yet not enough higher to place it in another phoneme" (Kantner and West 1960).

⁴ "A vowel made with the point of highest arching farther back on the tongue than is typical" (Kantner and West 1960).

of intensity and the mouth opening is constricted. The raised tongue displacement, either blade or dorsum as indicated, tends to have a hypertensive neuro-muscular influence upon the root of the tongue, the musculature of the floor of the mouth, the buccal areas, the walls of the pharynx, the faucal arches and the velum. Indeed, the muscular over-contractibility exerted upon the entire suprahyoid area has a hypertensive effect upon the external infrahyoid musculature (Last 1966:667-68) which, in turn, can have a deleterious influence upon the intrinsic muscles of the larynx, in no small part due to the unique positioning of the hyoid bone (Lawrence, forthcoming a). The hyoid bone has been largely overlooked in physiological research on vowel production and various parameters of sound (Shearer 1969).⁵

In phonemic /ju/, when raising and tensing is perceived, the tongue is unduly palatalized⁶ and thus in overly tense contact with the sides of the hard palate and the inner portion of the upper back teeth anteriorly as far forward as the bicuspid and, on occasion, the incisors. The lip and buccal musculature tends to be too tensed in retraction. The muscles of the floor of the mouth are overly contracted. Again, in phonemic /ai/, whenever raised forms are perceived, the lip muscles tend to be retracted in varying degrees of intensity from a subtle to a noticeable grimace, the cheek muscles are unnecessarily tensed and the tongue is raised and tensed as it follows the jaw up in a more constricted mouth opening than is considered optimal for this phoneme. The muscular hypertension existent, notably in the articulators and the faucal arches, has a pervasive tensing effect upon the entire vocal tract, carrying with it adverse acoustical and physiological concomitants.

The phonetic tendency toward raising and tensing is frequently accompanied by a perceptible elevation in pitch. In addition, the overtone-play in the sound spectrum is altered, the higher frequencies being reinforced as the lower frequencies tend to be filtered out due to a change in the size (Bronstein and Jacoby 1967:264), shape and texture of the walls of certain areas of the pipe-resonator system. In consequence, a so-called 'thinning' of the quality of the voice is noted. An additional adjunct to this tendency is the frequent perception of an acoustic event commonly described as "hypernasality" in which specific formant shifts in the overtone spectrum have occurred (Luchsinger and Arnold 1965). It is postulated that this event may primarily be the acoustic result of the HYPERTENSIVE MUSCULAR CONTRACTIONS occurring along various segments of the vocal tract, thus disturbing the optimal acoustic and physiologic functioning of the tract. In turn, a hypertensive effect may be exerted upon the vocal bands themselves, contributing to the acoustic impression frequently termed "nasality" (van den Berg 1962). Therefore, therapeutic attention is directed primarily to the neuro-muscular hypertension existent in the ENTIRE tract, admittedly variances

⁵ In addition, further scientific investigation needs to be conducted relative to the role of muscular over-contractibility ("muscular strain") and its effect upon "the tongue, the walls of the buccal tract and the glottis" (Jakobson and Halle 1968); indeed, upon the *entire vocal tract* (emphasis mine) relative to muscular hypertension.

⁶ Certain consonants, within specific sound contexts, may be similarly effected: e.g., [j] > palatalized [j̟] (Bronstein and Jacoby 1967:92, 138).

in degrees of muscular over-contractibility being present in certain areas of the tract on certain phonemes and in certain individuals (Jacobson 1967). Under these conditions, the major focus shifts solely from the area of the velum when the acoustic impression of so-called "nasality" is perceived (Greene 1964; Kaplan 1971; Bronstein and Jacoby 1967:260-264; Lawrence, 1970b). This attention to the ENTIRE TRACT is extremely important to the individual tailoring of therapeutic procedures.

The muscular hypertension (both supra- and infra-hyoid), as encountered in the phonetic tendencies herein described, may well be the precipitating as well as the perpetuating factor for dysphonias of functional etiology. Resultant tissue change upon the folds, as in vocal fold nodules, may ultimately be encountered (Tarneaud 1958). Consequently, the abatement of the disorder may be achieved, along with other appropriate therapeutic procedures, by the amelioration of the neuro-muscular hyper-function noted when raising and tensing occurs on certain phonemes.

The phonetic tendency toward BACKING and TENSING is perceived in American English, notably on the low back vowels /ɑ,ɔ/, the centering diphthongal combinations /ar,or/ and on the first element of the diphthong /ɔɪ/ (Lawrence 1970a). A hyper-functional positioning is present in the retraction of the tongue, often to an advanced degree, in which the root and the dorsum, as well as the tip, are retracted. Accordingly, the pharyngeal resonating cavity is obstructed due to the fact that the tongue does not change its volume but only its positioning and shape (Last 1966:614). In addition, the surrounding pharyngeal walls and faucal arches tend to be overly contracted. The velum, also, tends to be unnecessarily tensed, in some instances of acoustic aberrance almost to the degree of becoming immobile. Thus, when so-called 'backing' is perceived, an accompanying acoustic cue of hypernasality is ALSO frequently detected. However, this additional characteristic is here considered as a component acoustic factor of the NEURO-MUSCULAR HYPER-TENSION in these particular areas of the vocal tract. Not only does this contribute acoustically to a less than optimal tonal result but, as described in the presentation relative to raising, the muscular hypertension existent in the tendency toward backing may be the primary etiological factor in functionally-based dysphonias in which tissue change has occurred. Contact ulcers of the vocal processes may be the resultant manifestation of the indirect laryngeal trauma inherent in the tendency of backing (Jackson 1964) and its attendant hypertensive states in contiguous bodily areas. In addition, a lowered pitch of varying degrees is usually discernible. Not infrequently the familiar vocal fold lesions of nodules, polyps, polypous tissue, as well as non-infectious laryngitis, may be associated with this same phonetic tendency (Jackson 1964). In the clinical setting, the effective lessening of the muscular hypertension which accompanies this tendency (in American English primarily on phonemic /ɑ,ɔ,ar,or,ɔɪ/) contributes to the amelioration of the symptoms and the folds may be expected to regain normal resiliency and a healthy state.

In situations where the muscular hypertension has persisted to a point where muscular HYPO-function is noted, with its characteristic acoustic cues of vocal weakness,

muscular hyper-function is again suspect as the PRIMARY causative factor. The phonetic tendencies toward raising, backing, or palatalization, if noted, must be ameliorated and a more optimal muscular balance established between supra- and infra-hyoid areas, free of excessive muscular demands, or recovery from the insult imposed by the condition may not be attained. In addition, appropriate measures should be taken to provide the client with a more efficient source of pneumo-energy and bodily control of the phonation stream (Lawrence 1968b).

It is suggested that appropriate therapeutic procedures be employed in an ECLECTIC manner with each individual client as indicated by that particular client's needs and presenting symptoms (Lawrence, forthcoming b). However, it is imperative that the full implications of the above described phonetic tendencies be understood by the clinician and appropriate measures taken to ameliorate them if satisfactory therapeutic progress is to be achieved.

These phonetic tendencies may theoretically be perceived in any language system or in any particular dialect of a system. Indeed, the tendencies are not limited solely to the phonemes where most commonly encountered. They are recognized essentially by their accompanying physiological and acoustical manifestations. Therefore, the important conclusion is that application of these clinical findings may be made wherever the acoustic signal indicates their existence.

The clinician's primary goal is to ameliorate the symptom or symptoms—to assist each client in the attainment of a more optimum pneumophonic balance in phonation. It is suggested that the skill to recognize the hypertensive phonetic tendencies of raising and, conversely, of backing and the restoration of a more optimal neuromuscular tonus will be invaluable for the clinician handling voice disorders of functional etiology.

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DISCUSSION

BUYSENS (Bruxelles)

In Brussels Centre neuro-linguistique we have a lady patient whose front vowels are almost regularly raised and whose pitch is often elevated, which confirms your first description.

I would like to ask you whether you have been able to establish objectively the hypertension you mentioned.

LAWRENCE

My findings are physiologically and acoustically of a practical nature. They are limited

to the active clinical situation. The pitch changes described are indicated by routine examination procedures. I would welcome the opportunity for validation by further objective instrumentation, as the practical clinical evidence and the satisfactory amelioration of the described hypertensive factors in therapy would strongly indicate the possibility of objective validation of our clinical observations and findings.

KINLOCH (Fredericton, N.B.)

Do you know of any statistically valid study of the percentage of speakers showing nodule development or tissue change among the totality of the speakers of a dialect in which /i/, /u/, etc., are realised in very high allophones?

LAWRENCE

I do not know of such a study. Perhaps Dr. Arthur Bronstein (who's present) is aware of such a study. [Dr. Bronstein did not know of any studies of this nature.] Such a study would be extremely valuable as it would objectively validate routine clinical observations and findings.

SOVIJÄRVI (Helsinki)

Are you using some special exercises for the relaxation of the supra- and infra-hyoid muscles during the therapy concerning the neuromuscular hypertension? In Finland we want always to have a functional balance of all external laryngeal and hyoidal muscles exercising a patient of a hypertensional voice production.

LAWRENCE

We approach all therapy in an ECLECTIC manner — using whatever therapeutic procedures are indicated for each individual client. Thus, we do not have set 'special' exercises for the release of noted overcontractibility of supra- and infra-hyoid musculature. Rather, we are familiar with well-established techniques for the release of unnecessary neuromuscular hypertension in these particular bodily areas you cite and employ what appears to be needful with each particular client — also allowing creativity to come into play. Due to the great muscular complexity and interaction existent between supra- and infra-hyoid musculature, in release therapy the area is treated as a whole; it would be virtually impossible to attempt to release one particular muscle in this area as a singular event. We strive to obtain a balanced, yet dynamic, neuromuscular state in this body area free of excessive muscular demands. We prefer to employ the term RELEASE of noted extraneous muscular hypertension rather than to routinely use the word 'relaxation' as this latter term frequently appears to be grossly applied and misunderstood.