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An Experimental Study of the Effects of Voice Therapy vs. Physicians Advice on the Frequency and Severity of Vocal Nodule Recurrence

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AN EXPERIMENTAL STUDY OF THE EFFECTS OF VOICE THERAPY VS. PHYSICIANS ADVICE ON THE FREQUENCY AND SEVERITY OF VOCAL NODULE RECURRENCE

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INTRODUCTION AND RATIONALE

The Importance of a Voice

The voice is the medium for speech signals used in human communication. This makes it one of the indispensible functions on which social life is based (Starkweather, 1961). Brodnitz (1973) proposed the "Unless you work with your hands, voice is your most important tool" (p. 4). Van Riper (1972) expanded this idea further by stating that speech is the unique feature that distinguishes man from lower animals. In today's society the opportunities for interpersonal contact in business, politics and other areas are rapidly succumbing to the demand for instant electronic communications devoid of visual contact. In such situations we are increasingly forced to rely on voice only contacts (Craft, 1977). Much depends upon the quality, the character and handling of the voice. People from all walks of life are hired because of the attractiveness or persuasiveness of their voice (Brodnitz, 1973).

All societies develop value systems and a corresponding set of controls to insure that its members respect them (Van Riper, 1972). Van Riper (1972) theorizes that these value systems, and the controls that implement them, differ widely from culture to culture. While all human societies place high regard upon effective communication as a primary bond holding them together,

certain societies seem to prize it more than others. In our own culture, a highly competitive, upward mobile one, verbal skill is greatly rewarded (Van Riper, 1972). According to Van Riper (1972) effective speech in such a society is of the utmost importance if an individual is to gain and maintain membership or get the status and material possessions which are constantly held up to us as goals to be desired.

The tone of the voice and the manner of speaking affect the listener's perception of the speakers feeling-state (Starkweather, 1961). Starkweather (1961) theorized that these vocal guideposts suggest some of the personality characteristics of individuals, which often enable a person to recognize a friend without seeing him, and indicate the speaker's emotional condition at the moment. Some of us are more intuitive than others, but no hearing person is entirely lacking in the ability to gather and be guided by speech impressions (Sapir, 1927). Sapir (1927) related that we are taught that when a person speaks he says something he wishes to communicate.

> The human voice, when the man is not making conscious use of it by way of impersonation, does in spite of himself reflect his mood, temper and personality. It expresses the character of the man (Allport & Cantril, 1943, p. 37).

The inference is that the way in which we use our voice reflects not only our natural or cultural origin, but also our attitude towards any given object or group and even our personality and

physique (Addington, 1968). During infancy, prior to the learning of language, parents and children communicate largely through nonverbal vocal cues (Starkweather, 1961). Nonverbal vocal signals are influential and if at odds with the ideas presented through language, they are usually believed (Sauer & Marcuse, 1957). An example of this phenomena is when the parent believes the sounds and not the words when his child insists in a very tired and petulant voice that he is not tired (Starkweather, 1961).

Characteristics of a Voice. According to Greene (1972) the voice has subtle qualities which convey the personality of the speaker. She lists them as (1) pitch, (2) volume, and (3) timbre or quality. The voice, theorizes Greene, is linked with the physiognomy, build, facial expression, habits of dress and movement of the individual, so that a total impression is built up by the appearance a man presents. Greene further states that if we hear a voice without seeing the speaker, we gain a certain impression of his personality. Meano (1967) proposed that "the human voice's most dominant characteristic is that it reveals the spirit and intellect of man through its vast expressions of sentiments and emotions." (p. 3).

Human speech as a form of behavior may be considered as having many features (Van Riper & Irwin, 1958). The mature voice has a unique character dependant upon the structure of the head, neck and face of the individual. In the same sense that no

two faces are the same, neither are two voices (Greene, 1972). In the adult, voice delineates the personality of the speaker as much or more than the words he speaks (Rees, Levee & Adler, 1971). It is generally recognized that it is not what is said, but how it is said which is most important (Brodnitz, 1973; Greene, 1972; Meano, 1967; Rees, Levee & Adler, 1971).

Wilson (1972) proposed that a good voice has the following characteristics: (1) a pleasing voice quality, (2) proper balance of oral and nasal resonance, (3) the appropriate loudness, (4) a habitual pitch level suitable for age, size and sex, and (5) the appropriate voice inflections involving pitch and loudness. Wilson further proposes that the art of speaking should be such that it does not interfere with the previously stated characteristics. This broad definition allows for the widest possible vocal variance within the normal population. Van Riper and Irwin (1958) considered the dimensions of voice to be pitch, loudness and quality or timbre.

The Defective Voice

A defective voice calls adverse attention to itself (Berry & Eisenson, 1956; Boone, 1971; Brackett, 1971; Dickson, 1974; Greene, 1972; Van Riper, 1972; Van Riper & Irwin, 1958). One or more of its characteristics, pitch, quality or loudness, fails to meet the socially conceived standards of pleasantness (Berry & Eisenson, 1956; Van Riper, 1972). An individual with a

defective voice may begin to have speaking difficulties wherein his livelihood may be brought upon him (ASHA, 1971).

Greene (1972) states that the voice is the product of the most finely coordinated delicately balanced and harmonious movements of which the body is capable. Greene theorizes that it doesn't matter if a voice sounds pleasant or not as long as it is adequate and suitable for that person's social and economic situation. What is important is any sudden change in the vocal quality which the patient feels is unacceptable or uncomfortable to him. Van Riper and Irwin (1958) related that the voice can be defective as a function of age and sex. This can result from variance in pitch, pitch breaks, or an abnormal hoarse or husky voice. Moses (1954) theorized that a defective voice could be a function of social or economic status. In certain cultures there does seem to be some basis for this assumption. In Britain, for example, the voice as well as the articulation, serves as a reminder of class (Van Riper & Irwin, 1958).

When is a Voice Defective? A voice may be said to be defective in the following circumstances: a) when a defective structure or organic disorder of the vocal organs produces patterns of pitch, loudness or quality which are deviant enough to interfere with communication (Ballantyne & Groves, 1971; Berry & Eisenson, 1956; Boone, 1971; Greene, 1975; Van Riper & Irwin, 1958), b) when voice production results in organic disorders of the vocal organs (Berry & Eisenson, 1956; Boone, 1971; Brodnitz, 1963;

Brodnitz & Froeschels, 1954; Deweese & Saunders, 1964; Fisher & Loggeman, 1970; Greene, 1975; Moore, 1971; Rubin & Lerhroff, 1962; Van Riper & Irwin, 1958), or c) when the habitual manner of voice production results in a typical pattern of pitch, loudness or quality which are inappropriate and detract from the meaning or feeling of communication (Berry & Eisenson, 1956; Boone, 1971; Van Riper, 1972; Van Riper & Irwin (1958). Wilson (1972) classifies the voice and possibilities for defectiveness into three major categories (1) pitch problems, (2) disorders of loudness, and (3) quality deviations. He further states that a problem voice may be distracting or unpleasant to the listener and it may be severe enough to interfere with communication. Some voice problems (Wilson, 1972) signal the possibility of actual physical problems or pathologies. For example, a child with a mild nasality may have velopharyngeal insufficiency, and an adenoidectomy might create a more severe voice (resonance) problem.

The voice is more severely affected by <u>organic</u> abnormalities than any other disorder of speech (Van Riper & Irwin, 1958). One of the most common problems presented to the laryngologist is that of vocal nodules (Ballanger, 1969; Batza, 1970; Brodnitz, 1963; Brodnitz & Froeschels, 1954; Deweese & Saunders, 1968; Fisher & Loggemann, 1970; Fritz-Hugh & Chiong, 1958; Strong & Vaughn, 1971). Fritz-Hugh & Chiong, (1958) reviewed 300 cases

of benign lesions of the vocal cords. Pathogenic diagnosis of the vocal nodules was made in 134 of these patients, or in 44.7%. These findings correspond closely with the earlier findings of New and Erich (1938). Considering vocal nodules as inflammatory tumors, New and Erich found them to be by far the most frequent benign new formations of the cords. Within the 722 cases of benign laryngeal lesions studied, nodules occured in 322 or 46% (Arnold, 1962).

Vocal Nodules

Vocal nodules refer to small benign thickenings of the margins of the vocal cords (Ballanger, 1969; Ballantyne & Groves, 1971; Deweese & Saunders, 1968; Moore, 1971; Rubin & Lerhroff, 1962). Most researchers agree that nodules ordinarily occur at the junction of the anterior and middle thirds of the vocal cords, also known as the midpoint (Arnold, 1962; Ballanger, 1969; Cooper, 1971; Deweese & Saunders, 1968; Greene, 1972, 1975; Kleinsasser, 1968; Moore, 1971; Rubin & Lerhroff, 1962; Strong & Vaughn, 1971; Toolhill, 1975; Wilson, 1961, 1977).

> A vocal cord is made up approximately of an anterior two-thirds consisting of thyroarytenoid muscle and a posterior one-third of arytenoid cartilage. On phonation, major vibratory activity is performed by the muscular portions of the cords, and in excursions of wide amplitude, their midpoints meet with greatest force. The midpoint of the membraneous vocal cord, the site of predilection for nodules (Rubin & Lerhroff, 1962, p. 152).

Ash and Schwartz (1944) studied 138 cases of benign lesions of

the larynx including polyps and nodules and came to the conclusion that the different diagnoses (polyp and nodule) represented different stages of the same condition. Salinger (1956) used the label benign growths rather than differentiate between polyps and nodules. Ballanger (1969) supports this theory by stating nodules go through progressive inflammatory stages, with the young early nodules representing the polypoid stage. Epstein (1957) also believes polyps, polypoid degeneration and nodules to be histologically identical.

This view is not held by everyone. Rubin and Lerhroff (1962) state that two unrelated benign lesions can superficially resemble each other and for this reason, what appears to be a typical nodule may in fact be something quite different histologically. To further counfound the problem, nodules blend imperceptibly with polyps in size, shape and color and there may be no clinical and histological correlation simply because of terminology (Rubin & Lerhroff, 1-62). Arnold (1962) observed that polyps differ from nodules in that they may be pedunculated (possess a stalk) and originate from the subepithelial space of Reinke. He further proposes that with continuing mechanical trauma the polyp becomes more edematous and grows in size due to recurring hemorrhages while the nodule becomes more organized and hard. Jackson (1941) states that polyps can occur anywhere along the cord, not just at the midpoint as is the case with nodules.

Jackson further states that the polyp originates as a hematoma which becomes more or less organized in time, but which generally retains its reddish or purplish color. This differs significantly from the nodule which is greyish or white in color.

Physiological Development of Nodules. Upon examination by the laryngologist, a nodule/polyp, in its earliest stage, will be viewed as a sticky secretion on the anterior portion of the cords (Ballantyne & Groves, 1971). On phonation this secretion will be drawn out at the level of the junction of the anterior and middle thirds, as observed by Rubin and Lerhroff (1966) and Strong and Vaughn (1971). Gradually, a tiny elevation will be noticed on the free margin of one cord at first, but very soon afterwards on the other, and eventually definite nodules develop at these sites (Ballantyne & Groves, 1971). The primary lesion, or elevation, appears to be edema of Reinke's Layer, with varying degrees of vascularity (Strong & Vaughn, 1971). Reinke's Layer or space, is at the free margin of the membraneous vocal cord and is, according to Ballanger (1969), "a subepithelial potential space that is easily infiltrated by edema, fluid or blood" (p. 351). The nodules almost exact opposition to one another prevents complete adduction (closing) of the vocal cords (Ballantyne & Groves, 1971). Arnold (1962) states that experienced observers have great difficulty in differentiating visually, between soft and hard, fresh or old, acutely inflammed or chronically fibrosed types of nodules or polyps. Since nodules are an inflammatory

response to mechanical trauma, Ballanger (1969) theorizes that they would be expected to exhibit progressive inflammatory changes. Ash and Schwartz (1944) and Arnold (1962) agree with this concept and propose that nodules and polyps represent different stages in the same traumatic process. They classify the nodule/polyp into four progressive stages (1) fibroid, (2) polypoid (3) varix, and (4) hyaline.

Fibroid. The fibroid stage is viewed as a low, pale, undemarcated node (Ash & Schwartz, 1944). Arnold (1962) likens this beginning stage to a hematoma "composed of normal squamous epithelium which covers thin walled blood vessels and edematous stroma of loose fibrous tissue" (p. 211). A change in vascularity occurs in which the deeper original blood vessels extend out toward the epithelial surface. This thickening is due to a low grade of trauma to the vocal cords (Ash & Schwartz, 1944; Strong & Vaughn, 1971). There is the possibility that the laryngologist sees fewer of the fibroid nodes because, according to Ash and Schwartz (1944), patients do not consult the laryngologist soon enough.

Polypoid. This is the most common stage and one seen most frequently by the laryngologist (Ash & Schwartz, 1944). This early lesion looks reddish and soft (Ballanger, 1969; Deweese Saunders, 1968; Strong & Vaughn, 1971). It is covered by normal squamous epithelium, however, the underlying stroma may be edematous and exhibit increased vascularity, dilated blood

vessels and hemorrhage (Ballanger, 1969; Strong & Vaughn, 1971). Within the polypoid stage the lesion is sharply defined and is a more or less pedunculated transparent mass (Arnold, 1962; Ash & Schwartz, 1944). Within the polyp itself there is a proliferation of fibroblasts (a cell from which connective tissue is developed) however, they are not abnormal. These fibroblasts are widely separated by edema and, according to Ash and Schwartz (1944), are the result of irritation. Arnold (1962) has observed that this vasodilation and proliferation of connective tissue (fibroblast) is comparable to the polypoid reaction in other mucosa.

These first two stages (fibroid and polypoid) can be equated to Wilson's (1972) first two stages of nodule development.

> First, a localized slight reddening appears in the free margin of the vocal cord with the submucosa showing dilation of the thin-walled blood vessels. This may be the sign of a very small hemorhage or a mucos gland beginning to close. Second, there then occurs a localized swelling or thickening on the edge of the vocal cord with or without reddening (p. 32).

Varix. The growth in the varix stage is similar to that of the polypoid stage with the distinction being that the varix is more colored from blood content. Ash and Schwartz (1944) state that there are very few nodes in the varix stage. They theorize the varix nodes are not easy to recognize because there are many in which the vessels had dilated perceptibly but were still predominately polypoid and were classified as such. Within the

varix stage we begin to get the beginning of hyaline changes (Arnold, 1962).

Hyalin. The graduation into the hyalin stage is explained according to Friedberg and Seagall (1950) by the ratio of edema to solidifying hyalizination. The fibrous tissue of the hyalin node replaces the edema and hemorrhage and the node becomes more white, more organized, quite firm and at times hard (Ballanger, 1969; Deweese & Saunders, 1968; Jackson, 1941; Rubin & Lerhroff, 1962; Strong & Vaughn, 1971).

> Mature, or chronic nodules appear hard and whitish as the rest of the cordal epithelium. Their thickened epithelium is characterized by acanthosis, keratosis and focal parakeratosis. The underlying connective tissue shows compact fibrosis with little edema (Arnold, 1962, p. 213).

Ash and Schwartz (1944) theorize that only when hyaline dominates the lesion can it be classified in the hyalin stage. They state there are three distinct features which occur:

> First, interstitial, resulting from fusion and hyalization of interstitial fibrils; second, the hyalinization of intravascular thrombi; and third, hyalinization of the vascular walls (Ash & Schwartz, 1944, p. 328).

This concept is further supported by Ballanger (1969) who states that the more mature nodule will be more firm and contain areas undergoing fibrosis and hyalinization. They are seen as fibrous and pale and the surface epithelium becomes thickened. In the fibroid nodule, Deweese and Saunders (1968) state there are often two nodules exactly opposite one another which contact

during phonation. The lesions vary in size from no larger than a pinhead to as large as a split pea. Deweese and Saunders (1968) further state that some nodules are so tiny as to produce no symptoms, whereas others produce hoarseness.

> Most authorities agree that fully developed nodules are fibrous growths consisting of layers of epithelium that are benign and belong to the polyp family. Usually the nodes are pyramidal in shape and vary in size and composition from that of a small seed to a peppercorm. Both size and composition of the vocal nodules play an important part in the degree of hoarseness present. Though a large mass generally produces more breathiness a vocal nodule that is hard and not compressable can cause a faulty voice even though quite small (Wilson, 1961, p. 20).

Etiology of Vocal Nodules

It is the prevalent belief that vocal cord nodules result from continuing abuse of the vocal apparatus (Ballanger, 1969; Batza, 1970; Billeaud, 1971; Boone, 1971; Brodnitz, 1963; Brodnitz & Froeschels, 1954; Rubin & Lerhroff, 1962; Strong & Vaughn, 1971; Shearer, 1972; Toolhill, 1975; Van Riper, 1972; Van Riper & Irwin, 1958). According to Arnold (1962) vocal nodules represent a clear case of tissue reaction to mechanical trauma. The etiology of vocal nodules generally falls into four areas; (1) vocal abuse, (2) hyperfunction as a form of vocal abuse, (3) psychological, and (4) other (Ballanger, 1969; Batza, 1970; Billeaud, 1971; Boone, 1971; Brodnitz, 1963; Deweese & Saunders, 1968; Van Riper, 1972).

Vocal Abuse as a Cause for Nodules. Deweese and Saunders

(1968) theorize that the misuse of the voice such as in shouting and singing above one's normal range and especially abuse of the voice during a period of laryngitis, may produce vocal nodules (Van Riper & Irwin, 1958). Some vocally abusive behaviors listed by Boone (1971) are "crying, screaming, yelling, throat clearing, coughing, grunting and focalized cases of inappropriate pitch, loudness or quality" (p. 124). Boone (1971) further states that it appears to require only a minimal amount of vocal abuse each day to maintain or develop a laryngeal pathology. Boone's statements are supported by Cooper and Nahum (1967), Greene (1972), Shearer (1972), Wilson (1972)and Zwitmann and Calcaterra (1973).

> When the supply of expired air for phonation is inadequate or erratic, greater force is required to expel it through the glottis to cibrate the vocal cords and obtain adequate vocal volume. To raise pressure, the vocal cords are compressed in the midline and friction inescapable increases between their opposing surfaces . . .The friction imposed upon the edges of the vocal cords can produce a localized edema and hemorrhage in the mucous membrane covering . . . If the vocal abuse continues over a period of time permanent changes in the membrane take place with fibrous and formation of nodules, generally bilaterally, at the middle portion of the anterior two-thirds of the cords where excursions of the vibrating edges are greatest (Greene, 1975, p. 11).

According to Rubin and Lerhroff (1962), the possible components of vocal abuse are excessive use of the voice, overloud phonation, poor breath control and sometimes, inappropriate pitch. Fisher and Logemann (1970) describe the typical adult nodule patient as one who talks too loudly in an artificially lowered, harsh voice.

The pitch of the voice is an important factor (Ballanger, 1969), in that during speaking and singing the cords do not vibrate as a whole but in segments depending upon the pitch of the note. The anterior portion of the cord is active while the posterior portion is inert. The active portion lengthenes posteriorly as the pitch is lowered (Ballantyne & Groves, 1971). When an inappropriate pitch is used the cords come together in an abnormally violent manner (Ballantyne & Groves, 1971).

> There is a great variation in the amount of vocal abuse the larynx of different individuals will stand; but every larynx has its limits. To go beyond this limit means thickening of the cords, and a thickened cord means a hoarse voice. Not only is a thickened cord a poor vibrator but it throws great additional work upon the thyroarytenoid (Jackson & Jackson, 1959, p. 40).

Hyperfunctional use of the vocal mechanism is a specific form of vocal abuse (Boone, 1971). Boone (1971) proposed that the primary cause of vocal nodules appears to be a prolonged hyperfunctional use of the vocal mechanism. He further states that as long as the patient continues his abusive vocal behavior, the nodules will remain and tend to enlarge.

Hyperfunction as a Form of Vocal Abuse. Brodnitz (1965) felt many voice disorders begin with excessive use of muscular force, which Froeschels (1943) termed hyperfunction. Hyperfunction usually involves the entire vocal mechanism although certain areas of the vocal mechanism may show more hyperfunction sites than others (Brodnitz, 1963). In discussing vocal nodules and crossed

arytenoids Arnold (1962) drew attention to the "tendency of hyperkinetic persons to over use the pharyngeal and cervical muscles that are needed primarily for deglutination whenever they phonate. From this habitual overuse of unnecessary muscles the hyperkinetic type of strained, squeezed, and forced phonation results" (p. 207). Over exertion of the muscles of the larynx may cause irritation of the delicate tissues so they set up a pattern of hyperfunctional usage that persists after the infection has disappeared; the pattern of excessive muscular exertion and excess breath pressure then becomes a habit.

> Hyperfunctioning vocal practices may result in various pathologucal conditions in the larynx which cause the voice to sound hoarse, harsh or breathy, or a combination of these features. These pathologies include nodules, polyps, polypoid degeneration, vocal fold thickening hyperkaratosis, nonspecific laryngitis, hematomas, hyperemia of the vocal cords, and hyperplasia of the vocal cords. If there are incorrect vocal practices infection, such as chronic laryngitis, there may be changes in the larynx causing chronic inflammation known as corditis (Wilson, 1972, p. 24).

Psychological Etiology of Vocal Nodules. Greene (1975) theorizes that there is another etiological factor in the growth of vocal nodules. She proposed that nodules are a stage in misuse of the vocal organ which may be linked with a personality complex. Arnold (1962) supports this by stating that nodules are seen mostly in patients who have forceful and extroverted personalities and he concluded that the hyperkinetic phonation resulting in vocal nodules might reflect underlying psycho-

pathologies (Rees, Levee & Adler, 1971).

It has been noticed that when the professional use of the voice is surrounded by tension, anxiety and responsibility, vocal cord nodules are prone to develop (Brodnitz, 1963; Rubin & Lerhroff, 1962). Rubin and Lerhroff (1962) state there is an increasing awareness of the importance of psychological factors in the etiology of vocal nodules. Greene (1975) particularly stresses the need for assessment of the home background when therapy is undertaken. She further notes that anxiety and stress within the family unit or at school contribute to the expression of vocal abuse and this must be alleviated if therapy is to be successful.

Aronson et al. (1966) found that subjects in their study were suffering from acute and situational conflicts having a causal relationship to the voice problem. Ferguson (1955) suggested that certain personality types tend to produce voice with excessive tension, hyperfunction, leading to organic laryngeal damage. Diehl et al. (1959) found a relationship between the trait of anxiety and hoarse breathy voices. This was further substantiated by Rees, Levee and Adler (1971). Rubin and Lerhroff (1962) wrote that "the pathogenisis of vocal nodules emerges as an extended spectrum ranging from simple loud phonation at one end to unadulterated emotional tension at the other with varying degrees of the two between" (p. 153).

According to Greene (1972) there is a constitutional and personality factor common to individuals who develop nodules. They are mostly energetic, active, hardworking and anxious besides being talkative. Arnold (1962) and Luchsinger and Arnold (1965) state that vocal nodules present the reaction of vocal tissue to mental strain imposed by difficulties in adjusting to the demands made by a society in persons of a certain personality structure. Arnold (1962) states that one of the predisposing factors towards vocal nodules is:

> The psychosomatic constitution of the personality structure. Numerous authors have remarked on the general observation that nodules and polyps are seen in vociferous and aggressive personalities and much more rarely in soft-spoken, gentle-mannered and self-controlled individuals. Again, the personality structure is closely correlated with somatic body constitution . . . Thus we find the circle closed by observing the following correlation. Hypertension reaction to hyperplastic mucosa in the muscular body type is associated with aggressively hyperkinetic movements of phonation and a tendency toward the formation of nodules or polyps (p. 207).

Arnold concluded that the hyperkinetic phonation resulting in vocal nodules might reflect underlying psychopathologies. Speech pathologists and laryngologists commonly expect to find that personality factors are at the basis of voice disorders in cases where laryngeal pathology is absent (Rees, Levee & Adler, 1971). Heaver (1958) discussed the psychiatric findings encountered among patients with habitual dysphonia. They were seen to present definite trends were revealed by means

of two projective test techniques: the House-Tree-Person drawings and the Rorschach test. All of the tests were given, scored and interpreted by the same clinical psychologist. By using a unit frequency count of the number of times the various findings occured in the psychological test interpretations it was possible to arrive at a numerical assessment.

> It is thus apparent that both female and male patients with habitual dysphonia tend to be markedly hostile sado-masochistic, and emotionally immature. They tend also toward paranoid ideation, excessive fantasy and daydreaming, disorganization of the ego, withdrawal, and regressive attitudes. Very frequently, the hostility factor was seen to masquerade in other than the most obvious form - a clinical fact not likely to be perceived readily by the psychiatrically untrained physician (p. 25).

Other Etiologies of Vocal Nodules. In addition to the etiologies mentioned previously it is important to include other aggravating factors which contribute to the growth of nodules. Ballantyne and Groves (1971) propose the additional irritative factors are tobacco, alcohol, and dusty, stale atmospheres. Greene (1972) expands this list further by adding coughing and clearing of the throat, allergies, and atmospheric irritants and air pollution such as fumes in industry, deisel engine fumes, cement dust in building or carbon fumes from such things as printers ink.

Using the voice incorrectly and continuously against background noise is undoubtedly the basic and most damaging factor in formation of vocal nodules (Boone, 1971; Greene, 1972; Wilson,

1972). Arnold (1962) sums up the aggravating factors best with with the following examples:

> Smoking and drinking are common at social parties. Due to the assembly of many people in confined rooms, noise increases and voices are raised. Alcohol reduces mental inhibitions so that voices are raised even higher over the general commotion, and a lot of screaming may go on for many hours. At the same time, mucosal hyperemia is promoted by alcohol which is then exposed to the irritation effect of cigarette smoke. A certain raspiness of the voice ensues from mild temporary swelling of the the laryngeal membranes. This is then supressed by increased vocal effort. In this manner a vicious circle is instituted. Irritation of the vocal cords occurs, which is augmented by increased vocal effort, and this in turn augments the laryngeal irritation (pgs. 207-208).

Vocal Manifestations of Nodules

The presence of vocal nodules affects phonation by (1) interfering with the building up of sufficient air pressure beneath the cords and (2) interfering with the free vibration of the vocal edges (Van Riper & Irwin, 1958). Strong & Vaughn (1972) state the common vocal manifestation of vocal cord nodules is hoarseness. Since the nodules involve the free margin of the cords the vibratory patterns during phonation will be disrupted and cause hoarseness (Boone, 1971; Strong Vaughn, 1971). Boone (1971) theorizes there is no particular kind of voice which typifies the patient with vocal nodules. Van Riper and Irwin (1958) state that many clinicians who have dealt with vocal nodules emphasize the use of a voice that is too high pitched.

Certain audible features appear to be characteristic of vocal cord nodules. Undue vocal fatigue and hoarseness are commonly associated (Batza, 1970; Rubin & Lerhroff, 1962; Van Riper & Irwin, 1958) . Complaints of increasingly rapid vocal fatigue usually develop before persistent, frank hoarseness becomes apparent (Ballanger, 1969). Hoarseness in any degree may be present (Boone, 1971). Rubin and Lerhroff (1962) state there is a change in the quality of the voice which may range from merely breaking on a high-pitched note to severe hoarseness in all vocal dimensions. By using high speed photography Rubin and Lerhroff observed that the nodules seemed to upset the balance between cordal tension and subglottic air pressure, resulting in asynchronous vibrations of the cords and disruption of the vocal tone. The degree of vocal change as stated by Ballanger (1969) is not necessarily related to the size of the lesion. Rubin and Lerhroff (1962) theorize that small nodules often impair the voice out of all seeming proportion. If the nodules are relatively large the unaffected cord is unable to compensate completely for the projection, and air continually escapes from the space at each side of the projection. The voice is weak, husky and breathy (Greene, 1975; Van Riper & Irwin, 1958).

The pitch level may be noticably lowered, particularly when the nodules are large enough to add sufficient weight to the cords (Batza, 1970). A retarded vibratory rate

becomes pronounced when the cords have become edematous (Batza, 1970). Van Riper and Irwin (1958) state that the nodule prevents the cord from being blown open with equal amplitude, therefore producing a voice of low intensity. Van Riper and Irwin further state that in the beginning stages of nodule growth, a lowering pitch accompanies the increasing huskiness and hoarseness. They reason that the loaded cord will not vibrate as swiftly as one that is free. Batza (1970) theorizes that nodules of sufficient size interfere with complete approximation so that excessive air escapes on phonation. The air waste may give a husky quality to the voice.

Treatment of Vocal Nodules

Within this paper we are concerned with the treatment of mature/advanced vocal nodules only. Mature nodules are fibrous, hard and well-defined in nature with vocally abusive causes of long duration (Boone, 1972). There is much controversy over the treatment of advanced vocal nodules (Van Riper & Irwin, 1958; Batza, 1970; Rubin & Lerhroff, 1962). The goal of the vocal rehabilitation is the restoration of the usable and normal voice in all conditions that impair or prevent vocal function (Brodnitz, 1963). Brodnitz (1951) states that the treatment should aim at "the restoration of a voice that is well produced, stands up under prolonged use and serves satisfactorily as an instrument of communication and of professional and artistic use" (p. 151).

Ballanger (1969) and Van Riper and Irwin (1958) propose that the treatment of mature vocal nodules should be on an individual basis with three recommendations (1) the nodules be removed by surgery, (2) the patient be advised to undergo a long period of vocal rest without phonation, and (3) new habits of phonation should be developed by vocal training.

Surgical Removal of Vocal Nodules. Deweese and Saunders (1968) theorized that although voice rest and speech therapy may restore a normal voice in some patients, most mature vocal nodules are best removed surgically. If after three months of conservative management, the cord lesion does not improve and the patient is still dissatisfied with his voice, Strong and Vaughn (1971) recommend vocal fold surgery should be done. It has been their experience that surgery is required in about 50% of the cases. Rubin and Lerhroff (1962) related that the size and configuration of the nodules may indicate that preliminary vocal rehabilitative measures would be useless and surgical removal would be necessary to restore the cord. Surgical removal, according to Arnold (1962), is mandatory in the following conditions (1) large nodules of long standing in adults, (2) all unilateral afflictions, (3) polyps with any localization on the cord, (4) polypoid degeneration of one or both cords, and (5) all cordal lesions in patients beyond middle age. Arnold explains that lesions of this type can no longer

regress spontaneously, nor through vocal rehabilitation. When the nodules are fully matured Van Riper and Irwin (1958) propose surgery followed by speech therapy as the best course, while Ash and Schwartz (1944) recognize surgery as the only form of treatment.

The surgical procedure generally used to remove advanced vocal fold pathologies requires direct laryngoscopy with general or localized anesthesia. Strong and Vaughn (1971) discuss the procedure used:

> Using the usual arrangement of the surgical microscope fitted with straight occular tubes and a 400mm. front lens and a Jako-Pilling or Kleinsasser laryngoscope, the vocal cords can be viewed . . . under general anesthesia. The small cuffed endotracheal tube in the interarytenoid space helps to keep the cords immobile and in an abducted position . . . After viewing the nodule from above and also below with a small mirror, the nodule is grasped with a 1.5mm. upturned cupped forceps: if the nodule is engaged in the side of the cups it is less likely that the 'bite' will be too big. It is safer to remove it in several small bites than by one overly deep bite.
> Removal of the nodule should be started by gentle retraction posteriorly and as soon as a tear appears anterior to the nodule, retraction should be directed forward to cause a tear in the mucosa behind the nodule so that it can be removed. In this way a strip of mucosa is not unnecessarily removed along with the nodule. A similar maneuver can be executed by first depressing the nodule inferiorly and causing a tear along the upper surface of the nodule followed by retraction superiorly and removal of the nodule.
> On occasion it is preferable to start the dissection with a sickle knife while the nodule is held on the stretch.
> Tiny residual tags of mucosa may be removed in a similar fashion until the cord is perfectly straight. The elastic fibers of the cord are not usually exposed

> in this procedure.
> Voice rest should be maintained for a week following which the free edges of the cords are usually healed (pgs. 916-918).

Voice Rest. One of the recommended therapy techniques for reduction of vocal tension and consequent strain of the vocal mechanism is a period of voice rest (Billeaud, 1971; Boone, 1972, 1977). The purpose of voice rest is to reduce the number of times the vocal folds approximate so the operated tissue may heal and begin to return to normal (Arnold, 1962; Boone, 1977; Graham, 1978; Kleinsasser, 1968; Toolhill, 1975; Wilson Rice, 1977). Arnold (1962) defined voice rest as the avoidance of vocally abusive behavior and a reduced amount of speaking. Rubin and Lerhroff (1962) are favorably disposed to vocal rest, where it appears as though the nodule might resolve:

> . . . when opposing nodules are of different size, the smaller one will occasionaly disappear thereby restricting the need for surgery to one cord . . . in patients who smoke and inhale there is usually associated irritation of the vocal cords which should resolve before final evaluation is made (p. 157).

Arnold (1962), Brodnitz and Froeschels (1954), and Greene (1972) advised modified voice rest; Wilson and Rice (1977) also recommend a 50 to 75% reduction in the total amount of talking. The duration of the vocal rest is generally from 10 days to two weeks in some severe cases up to a period of several months (Arnold, 1962; Billeaud, 1971; Boone, 1977; Cooper, 1974; Deweese & Saunders, 1964; Greene, 1972; Kleinsasser, 1968;

Moore, 1957; Perkens, 1957; Wilson, 1977). Ash and Schwartz (1944) state vocal rest should be demanded during the post operative period of tissue reaction to instrumentation and tissue repair. Jackson (1941) recommends having the patient on voice rest for a period of a week or two, especially if there is an inflammed, reddened nodule. Greene (1972) however, proposes that voice rest should not exceed a week as it is thought it is not desirable for muscles and joints to be inactive for any length of time. Brodnitz and Froeschels (1954) support this by stating that complete voice rest exposes the vocal mechanism to the danger of muscular atrophy by inactivity which goes against all principles of functional rehabilitation. Rubin and Lerhroff (1962) offer a solution to the problem of complete voice rest with the use of a traumatic whispering.

> If words are formed by the lips during simple exhalation there is minimal cord activity. This technique contrasts sharply with the stage whisper . . . Careful and continued attention to the proper technique of aphonic whispering is imperative when this is allowed as a compromise (p. 157).

Voice Therapy

In patients who have had surgical removal of vocal nodules recurrence of polyps is extremely frequent unless some attempt is made to alter the patients abusive speaking habits (Arnold, 1962; Ash & Schwartz, 1944; Ballanger, 1969; Ballantyne &

Groves, 1971; Berry & Eisenson, 1956; Boone, 1974; Brodnitz, 1973; Brodnitz & Froeschels, 1963; Cooper, 1971; Deweese & Saunders, 1968; Dickson, 1974; Ferguson, 1955; Fisher & Logemann, 1970; Greene, 1975; Holinger, 1951; Jackson, 1941; Rubin & Lerhroff, 1962; Salinger, 1956; Shearer, 1972; Strong & Vaughn, 1971; Toolhill, 1975; Wilson, 1961; Zwitmann & Calcaterra, 1973). Arnold (1962) warns that surgery alone does not cure the underlying cause of faulty phonatory habits or emotional disorders.

> It is not unusual clinically to see the surgical removal of nodules in adults, only to have new nodules appear several weeks later. Unless the underlying hyperfunctional vocal behaviors are identified and reduced, vocal nodules have a stubborn way of reappearing (Boone, 1971, p. 55).

When the use of the voice is surrounded by tension, anxiety and responsibility Strong and Vaughn (1971) suggest that it causes neuromuscular incoordination (hyperfunction) during voice production and nodule-polyps are especially prone to develop. If the patient does not undergo a period of vocal re-education and training to eliminate the vocally abusive hyperfunctive behaviors Ballantyne and Groves (1971) state that a recurrance would be almost certain.

The main goals of voice therapy in patients who have had surgical removal of nodules/polyps are: (1) location of vocally abusive behavior (2) increasing patient awareness of his vocally abusive behavior (3) reduction and elimination of vocal abuse and

(4) re-education in a normal method of phonation (Arnold, 1962; Ballanger, 1969; Ballantyne & Groves, 1971; Berry & Einsenson, 1956; Boone, 1971, 1974; Brodnitz, 1973; Cooper, 1971; Dickson, 1974; Greene, 1975; Toolhill, 1975; Wilson, 1961, 1972; Zwitmann & Calcaterra, 1973).

Location, Awareness and Reduction and Elimination of Vocally Abusive Behaviors. The first three goals deal with the patient's vocally abusive behaviors and will be discussed collectively. There is no more effective task the clinician can do than isolate for the patient those situations in which he is vocally abusive, such as yelling, screaming, crying, coughing, throat clearing etc. (Arnold, 1962; Berry & Einsenson 1956; Boone, 1971; Wilson, 1961, 1972; Van Riper & Irwin, 1958). It appears that a patient who has once had a dysphonia (Boone, 1971) can no longer tolerate vocal abuses as well as someone in the normal phonation. "The patient may have to avoid unnecessary vocal excesses for the rest of his life (Boone, 1971, p. 124)." According to Van Riper and Irwin (1958) when hoarseness is attributed to excessive and improper use of the voice, improvement in the voice is directly proportional to the success in correcting vocal abuse. For any voice patient with approximation or mass/size problems of the vocal folds, vocal abuse, according to Boone (1971) and Wilson (1961, 1972), should be eliminated or at least reduced.

The patient must be made aware of his undesirable habits and substitute activities must be suggested for each one (Wilson, 1972). Wilson (1972) relates that the patient must be informed that many of his vocal abuses are harmful to him even though other people may not suffer disasterous results from such practices. He has observed that in most instances it is advisable to help the patient understand his own problem by giving him the basic facts about his condition and explaining the rationale for eliminating the vocal abuse. Ingram (1977) supports Wilson's observations and provides his voice patients with a pamphlet "Helping Your Voice Get Better" to help acquaint them with their problem (see Appendix A).

Wilson (1972) states that the program for eliminating or modifying vocal abuse is structured around the following: (1) the patient is made aware of what vocal abuse is, (2) he identifies the vocal abuse in others, (3) he identifies the vocal abuse in himself, (4) the places where the vocal abuse is used are listed, (5) the patient is made aware of the auditory and kinesthetic aspects of his vocal abuse, and (6) the elimination of the vocal abuse.

Re-Education in the Normal Method of Phonation. The patient must be taught improved methods of phonation to obtain better quality (Toolhill, 1975). Toolhill (1975) relates that this improvement is based on training for discrimination of quality.

Wilson (1961, 1972) has observed that a change in pitch will many times aid the patient in improving his method of phonation. His observation is supported by Batza (1970), Boone (1974), Dickson (1974), Greene (1975), Toolhill (1975), and Van Riper and Irwin (1958).

Brodnitz and Froeschels (1963) advocate the use of the chewing method for the elimination of the vocally abusive hyperfunctional behaviors. Boone (1974) also includes the chewing approach as one of his techniques used in voice therapy. He suggests other techniques such as altering tongue position, digital manipulation, negative practice, open mouth, relaxation, target voice model, and yawn sigh to mention a few. Boone (1974) agrees with Wilson (1972) that a change in loudness is another avenue to explore when searching for a better method of phonation for the patient.

Regardless of the specific technique used, voice therapy for the patient generally follows a heirarchial sequence: (1) discrimination, (Boone, 1977; Brackett, 1971; Cooper, 1971; Moore, 1971; Rubin & Lerhroff, 1962; Wilson, 1961, 1972; Wilson & Rice, 1977), (2) confrontation (Boone, 1977; Brackett, 1971; Van Riper, 1972; Wilson, 1972), (3) searching (Boone, 1977; Brackett, 1971; Deal et al, 1976; Moore, 1971; Wilson, 1972; Wilson & Rice, 1977), (4) stabilization (Brackett, 1971; Van Riper, 1972; Wilson, 1972), and (5) generalization (Brackett,

1971; Deal et al., 1976; Wilson, 1972).

The discrimination step consists of the patient learning the difference between proper vocal habits and abusive vocal habits and being able to identify them within a model (Boone, 1977; Brackett, 1971; Rubin & Lerhroff, 1962; Wilson, 1972).

Confrontation is achieved when the patient becomes aware that he is performing vocally abusive behaviors. He recognizes and identifies his own error behaviors (Boone, 1977; Moore, 1971; Wilson, 1972).

Within the searching phase the patient and therapist work jointly to find the proper comfortable phonation for the patient (Boone, 1977; Brackett, 1971; Moore, 1971; Wilson, 1972).

In stabilization the patient strengthens the appropriate phonatory behaviors (Boone, 1977; Brackett, 1971; Van Riper, 1972).

In generalization the patient uses the proper phonation in varied situations (Boone, 1977; Brackett, 1971; Wilson, 1972).

An extensive review of these five basic steps was made by Graham (1978) (see Appendix B for complete description).

Physicians Advice. In this treatment the physician usually tells the patient that he needs to change his phonatory habits (Wilson & Rice, 1977). Several types of advice can be given to the patient (1) stop abusive phonation, (2) stop smoking, and (3) voice rest (Arnold, 1962; Ash & Scwartz, 1944; Ballanger,

1969; Ballantyne & Groves, 1971; Berry & Eisenson, 1956; Boone, 1974; Brodnitz, 1963; Cooper, 1971; Deweese & Saunders, 1968; Dickson, 1974, Ferguson, 1955; Fisher & Logemann, 1970; Greene, 1975; Holinger, 1971; Jackson, 1941; Rubin & Lerhroff, 1962; Salinger, 1966; Strong & Vaughn, 1971; Wilson, 1961, 1974; Zwitmann & Calcaterra, 1973). In telling the patient to follow the three recommendations listed above the physician assumes that the patient will change his method of phonation. The patient is expected to correct his improper phonatory habits by himself (Zwitmann & Calcaterra, 1977).

STATEMENT OF THE PROBLEM

The goal of vocal rehabilitation is the restoration of the usable, and where possible, normal voice in all conditions that impair or prevent vocal function (Brodnitz, 1963). Boone (1972, 1977), Brodnitz (1970), and Wilson (1972) theorize that a voice pattern of vocal abuse can persist after the nodule has been surgically removed. This pattern of vocalization, if continued over a period of time, can become habitual (Brodnitz, 1967). The fact that maladaptive vocal behavior, like other phonation, becomes a highly automatic motor response appears to be the primary reason why poor vocal habits maintain themselves (Boone, 1971). The improper voice production, according to Boone (1972), quickly becomes automatic and involuntary.

Ash and Schwartz (1944) noted that in their clinical experience they viewed acute pathologies: most patients had waited a matter of months to over 5 years before seeking medical advice. Their conclusion was that the physician and speech pathologist see more of the mature nodules/polyps because the patients do not consult the laryngologist soon enough. Patients who do see the physician and speech pathologist usually have a history of chronic vocal abuse.

Graham (1978) examined the effectiveness of three communication techniques: (1) therapy, (2) physician's advice, and (3) a printed pamphlet on vocal abuse, with patients who had vocal fold pathologies. No significant differences were found between the three techniques. Graham proposed that one of the possible reasons for not attaining significant differences was that two groups (treatment and control) differed significantly in the etiology and duration of the vocal abuse and pathology. The control group consisted of subjects with acute, immature vocal fold pathologies with histories of vocally abusive behaviors of short duration, while the treatment group consisted of individuals having chronic, mature pathologies. Since longer durations of vocally abusive behaviors tend to result in stronger habit formation than those of short duration, it was suspected that the two groups were not matches. However, if both groups (treatment and control) were similar in the duration of their vocally abusive behaviors and maturity of their nodules/polyps, the true effects of voice therapy versus physician's treatment only might be assessed.

The purpose of this study is to compare post-operative recurrence of vocal fold pathologies in individuals having long histories of vocally abusive behaviors who have had formalized voice therapy with similar patients who have not had voice therapy. The hypothesis proposed is:

In patients who have long histories (2 months or longer) of vocally abusive behaviors, those who receive voice therapy will have significantly less recurrence of vocal fold pathologies than similar patients who receive only physician's advice.

METHODOLOGY

Test Sites

All subjects were from 12 physicians' offices within the Central Florida area. The voice therapy sessions were performed in four of these offices.

Subjects

A prerequisite for qualification as a subject was a history of vocal abuse for not less than two months previous to having undergone surgical removal of his vocal fold pathology. All subjects were divided into either the therapy of the non-therapy group. The therapy group included those individuals who had a minimum of one formalized voice therapy session, administered by a certified speech pathologist, in either the pre or post-operative period. The non-therapy group consisted of those subjects who had no therapy sessions.

Design

The independent variable for the experiment involved two communication techniques (1) verbal advice from the physician (control group), and (2) individual therapy from a speech pathologist (treatment group).

The control condition was performed in all offices. The treatment condition was performed in four offices that employed the services of a speech pathologist.

The dependent variable for both groups (treatment and control) was the condition of the vocal folds post-surgically, in reference to possible recurrence of nodules or polyps.

Procedure

The medical records of patients who underwent vocal fold surgery during the calendar years of 1977 and 1978 were reviewed to obtain the following data:

1. age
2. sex
3. any prior laryngeal surgery
4. date of surgery
5. diagnosis of removed pathology
6. length of vocally abusive patterns pre-surgery
7. physician's advice/recommendations
8. physician's observation of vocal quality
9. vocal abuse history
10. subsequent post-surgical indirect laryngoscopic examinations and the physician's physical description of the vocal folds on these examinations.

The speech pathologist employed similar therapeutic procedures for each patient in the treatment condition. Each patient received therapy in a 30 minute session once a week. Therapy emphasized the following areas: (1) location of vocally abusive behavior, (2) increasing patient awareness of his vocally abusive behavior, (3) re-education in a normal method of phonation, and (4) reduction and elimination of vocally abusive behaviors.

From this data a profile for each patient was drawn (Appendix C).

Dependent Measure

The condition of the vocal folds was subjectively rated by the physician on each post-surgical indirect laryngoscopic examination. The researcher categorized these observations on a four-point scale: (1) clear, (2) edamatous, (3) thickening and (4) nodule/polyp. In addition a "u" was recorded regarding a unilateral affliction and a "b" was recorded regarding a bilateral affliction. All subjects were rated for each indirect laryngoscopic examination performed post-surgically.

RESULTS

Table 1 (p. 42) presents data which is relevant to a test of the hypothesis. Of the 41 subjects in the control group, 16 had a recurrence of nodules (39.03%). The treatment group consisted of 27 subjects, eight of whom had a recurrence (29.63%). An approximation to the Binomial Table was performed and a Z score obtained on the dependent variable observations between the treatment and control groups. Within the treatment group the number of subjects who did not exhibit a recurrence was significantly lower than those who did ($Z=2.32$, $p<.05$). The same comparison within the control group produced nonsignificance ($Z=1.44$, $p>.05$). A Z test for frequency of recurrence of vocal nodules was conducted between the treatment and control conditions. The test yielded nonsignificant differences ($Z=.118$, $p>.05$). The hypothesis was not supported on initial investigation.

Of the 27 subjects within the treatment condition, eight received only one session of voice therapy. Five of those eight subjects had a recurrence of nodules/polyps. These subjects were included within this study to investigate all levels of therapeutic treatment and their effectiveness. The data indicated that one

session of voice therapy is not adequate to remediate hyperfunctive voicing habits.

Boone (1974), Brodnitz (1958) and Deal et al., (1976) in similar studies, have found the range of therapy sessions required for successful voice therapy to be 17-77 sessions. For this reason, the Z test, between the treatment and control groups was repeated, but with the exclusion of the eight subjects who received only one session of voice therapy (see Table 2). A significant difference was found between the treatment and control conditions ($Z=1.80$, $p<.05$). This finding supports the hypothesis that fewer recurrences of vocal fold pathologies would result with voice therapy than for subjects who receive physician's advice alone.

Severity of Nodule Recurrence. An additional test of the hypothesis involved the examination of the severity of recurrence as the function of the voice therapy/physician's advice variable. In the collection of data each post surgical laryngoscopic examination was given a condition rating: (1) clear, (2) edematous, (3) thickening, (4) nodule. The condition rating of the last laryngoscopic examination was used to determine the level of recurrence of a pathology (see Table 3). A Kendall Tau Correlation was conducted with nonsignificant results. A further analysis was performed on all subjects who received a condition rating of 2, 3 or 4 to determine the severity of those subjects who had some level of recurrence.

Results of the Z test indicated that, of those subjects who had other than clear vocal folds (condition rating 1) the severity of recurrence was significantly milder (condition rating 2) than a possible chronic recurrence (condition rating 4) (see Table 4). This mild recurrence was present in both the treatment ($Z=3.20$, $p>.05$) and the control ($Z=4.54$, $p>.05$) groups. An additional Z test was performed between the treatment and control groups with no significant difference ($Z=0$) in the severity of recurrence.

Possible relationships between the dependent measure (frequency of recurrence) and the additional variables of sex, age, length of problem pre-surgery, and number of therapy sessions were investigated. A series of Kendall Tau correlations indicated that none of these variables contributed measurably to either recurrence or the severity of recurrence of the vocal fold pathologies. A trend did exist between the number of therapy sessions and the dependent measure ($p=.11$). The trend is in the direction of a longer therapy sequence for the reduction of recurrence of nodules.

Table 1

Z Test of Recurrence of Vocal Nodules

Within Group	Subjects	Recurrence	Percentage	Z Score
treatment	27	8	29.63	2.318*
control	41	16	39.03	1.441

*=Z score of 1.65 and > = .05 level of significance

Table 2

Z Test of Recurrence of Vocal Nodules

Excluding Subjects With One Therapy Session

Within Group	Subjects	Recurrence	Percentage	Z Score
treatment	19	3	15.78	4.0896*
control	41	16	39.03	1.441
Between Groups				Z Score
treatment vs. control				-1.801*

*=Z score of 1.65 or > = .05 significance level

Table 3

Post-Surgical Indirect Laryngoscopic Examinations

Condition Rating	Number
Control	
1	25
2	14
3	2
4	0
Treatment	
1	19
2	8
3	1
4	0

1 = clear

2 = edematous

3 = thickening

4 = nodule

Table 4

Z Test of Severity of Nodule Recurrence

Within Group	Recurrence	Z Test
treatment	8	3.2071*
control	16	4.5356*
Between Groups		**Z Test**
treatment and control		0

* a Z score of 1.65 or > = .05 level of significance

DISCUSSION

The voice is one of the indispensable functions on which human life is based (Starkweather, 1961). The importance of an appropriate voice is evident if an individual's livelihood is endangered due to poor vocal use (ASHA, 1971). Vocal nodules/polyps are one of the most common problems affecting the appropriate use of the voice and are noted as being the most frequent organic formations on the vocal cords of adults today (New & Erich, 1939).

This study compared the effects of voice therapy on physician's advice to the patient, in the treatment of patients who had surgical removal of vocal nodules/polyps. Two groups were studied: (1) patients who underwent surgical removal of vocal nodules/polyps and received physician's advice, and (2) patients who underwent surgical removal of nodules/polyps and received physician's advice and voice therapy.

The physical condition of the vocal folds was judged at each post-surgical visit to the physician. Scores were obtained regarding the recurrence of nodules/polyps. Frequency of recurrence was compared between the two groups (treatment and

control) and the results indicated that there were no significant differences between the treatment and control groups (see Table 1). There was a 39% recurrence rate within the control group, while the treatment group received a 19% rating. These findings (see Table 1) indicate that a patient having surgical removal of nodules/polyps has a 20% greater chance of having a recurrence with physician's advice alone. Within this study the criterion for a subject to be placed into the treatment group required that he receive at least one session of voice therapy either pre or post-surgery. Of the 27 subjects in the therapy group, eight had only one session of therapy. These eight subjects ended voice therapy after one session, contrary to the wishes of the therapist. Five of those eight subjects had a recurrence. The total number of recurrences for the entire treatment group was eight. As may be seen, five of those eight recurrences were within the one therapy session group.

Deal et al. (1967), in a study regarding vocal nodules, found that remediation took from 17-77 voice therapy sessions. Boone (1974) did a similar study on dismissal criteria for nodules/polyps and found the average length of treatment to be 14.4 sessions. This is in sharp contrast to one session remediation process. The recurrence results suggest that one voice therapy treatment is not enough to remediate the

inappropriate vocal habits. It is questionable if one session would seem to constitute "therapy." An analysis was performed between the treatment and control groups with the exclusion of the eight subjects who had only one session of therapy (see Table 2). This removed five recurrences and three non-recurrences from the treatment group, which yields the ratio of three recurrences to 19 subjects. The statistical analysis revealed a significant difference ($Z=1.801$, $p>.05$) between the therapy and control groups. This supports the hypothesis that patients who receive voice therapy have significantly fewer recurrences of nodules/polyps than those who receive physician's advice alone.

Brodnitz (1958) found similar results when 17 patients acquired recurrences after surgery without vocal retraining. Brodnitz theorizes that without extensive and successful vocal retraining, recurrences are frequent, since the underlying cause of the lesion continues to be effective.

Subjects who had only one session of voice therapy were included within this study to encompass all possible levels of therapeutic treatment and to investigate the success or failure of patients who terminate after one therapy session. The results of this study support the assumption that complete and successful vocal retraining takes more than one voice therapy session, and that remediation of inappropriate vocal

habits must be complete to prevent recurrence.

Severity of Nodule Recurrence. Patients received a post-surgical rating on the condition of their vocal folds for each laryngoscopic examination by the physician. A rating of 1) clear, 2) edematous, 3) thickening, and 4) nodules/polyps was given to each post-surgical laryngoscopic examination (see Table 3). In comparing the treatment and control groups no significant difference was found in the severity of nodule recurrence. However, when looking at those patients in each group who did have some level of recurrence, (ratings of 2, 3, or 4) all subjects had a low level of recurrence (rating 2) (see Table 4). Boone (1974) and Deal et al. (1976) observed the same phenomena of mild recurrence with their studies of voice therapy in treatment of nodules/polyps. This indicates that for both groups, when the subjects did not have clear vocal folds, the recurrence they did have was mild. This variable was present equally between the two groups.

Pre-Surgery Visits to the Physician. An analysis of the data was conducted within the control group for the number of visits each subject made to the physician prior to surgery. This analysis was conducted to insure that no interaction occured between the number of pre-surgery visits and recurrence of nodules/polyps. It was felt that an extended number of visits to the physician could constitute some form of

therapeutic treatment. Each physician discusses the patients problem somewhat differently. Since no control was possible on physician's advice to his patient, control was needed to insure that no physician performed "therapy" with his patients through length of visits - no such interaction occured.

Number of Therapy Sessions. An analysis of data was performed within the treatment group between the number of therapy sessions each subject received and the recurrence of nodules/polyps. The results indicated that no interaction was present (p=.1085). The figure does, however, approach significance at the .05 level and indicates a trend in the direction of multiple therapy sessions. This trend is in agreement with studies conducted by Boone (1974) and Deal et al. (1976). Deal et al. (1976) was able to double his success of therapy from seven patients to 15 patients between a period of two to six months post-surgery. This increase in therapy success was improved to a greater extent when sessions were extended through the six month period (15 patients to 20 patients).

In a study conducted by Boone (1974) the mean number of therapy sessions was 16.4 with a range of 4-33 sessions in subjects who had successful remediation. His mean for failure to remediate nodules/polyps was 10.5 with a range of sessions from 3-22. Both studies show a marked improvement in success

as the number of therapy sessions increased.

It is important to note that the range of therapy sessions within this study was 1-9 with a mean number of sessions of 3.6. The range and mean number of therapy sessions were far below those observed by Boone (1974) and Deal et al. (1976). There are however, the same results in regard to remediation of vocal nodules/polyps.

Age and Sex. No significant difference was found between the variables of sex and age and the dependent measure of recurrence of nodules/polyps. This factor shows that no relationship was present between subjects who had recurrences of nodules/polyps and their sex or age and eliminates these two variables as intervening factors within this study.

This finding is in contrast to a study conducted by Brodnitz (1958) in which 102 of 119 nodule cases were females. There were 68 subjects within this experiment with nodules/polyps. Forty-seven were females, while slightly less than half that number, 21, were male. This relates more closely with a study (Boone, 1974) in which 18 of his 25 subjects were female.

The mean age within this study was 45 years which coincides closely with findings of Boone (1974), in which the mean age of subjects was 35.2, and Brodnitz (1976), whose subjects had a mean age of 38.8.

Length of Problem Pre-Surgery. The duration of the voice problem pre-surgery was equal between the two groups. The range for the treatment group was two months to 20 years, which was similar to the control group range of two months to 25 years. No significant difference was found between these groups. The results indicate that the duration of the problem pre-surgery has no bearing on whether or not the patient has a nodule/polyp recurrence. This finding can be interpreted to mean that it is of little consequence whether a subject has a dysphonic voice for 25 years or two months - his chance of having a recurrence is the same.

It is important to realize that the subject must have had the faulty pattern for a minimum of two months prior to surgery. This two month time period allows for habit formation of poor voicing, as theorized by Boone (1972, 1977), Brodnitz (1970), and Wilson (1971). This theory is supported by the results of this study. When looking at Table 2 there was a significant difference in recurrence of nodules/polyps between therapy and non-therapy groups. The fact that five of the eight treatment subjects had recurrence of nodules further substantiates this. They did not receive sufficient retraining in voice control to change their poor voicing habits, and subsequently they had a recurrence. Boone (1972, 1977), Brodnitz (1970) and Wilson (1977) have theorized that without proper training in

voice use, nodules/polyps will reoccur due to habit formation of hyperfunctional voicing. This study substantiates this finding.

Implications. In examining the dependent measure chosen for this study the assumption was made that with continuation of vocal abuse a recurrence of the pathology, nodule/polyp would be forthcoming. Boone (1974) however, found many of his subjects no longer had pathologies but were still dissatisfied with the quality of their voicing. Brodnitz (1958) obtained similar results in which seven of 35 patients had clear vocal folds but unacceptable voices. Boone (1977), Brodnitz (1958) and Wilson (1974) state the goal in remediation of vocal nodules/polyps is for the patient to have a successful, comfortable, longlasting voice, and that the patient be satisfied with the vocal quality.

The results of this study indicated that there were significantly fewer recurrences of nodules/polyps in subjects who received voice therapy than those who received physician's advice alone. Future research in this area should include dependent measures of voice quality and/or patient satisfaction with the voice. This should involve procedures such as recording patients vocal quality prior to surgery, or initiation of phonation post-surgery and through the various levels of voice therapy. Again, speech therapy should be contrasted to

physician's advice alone, since most individuals undergoing removal of nodules/polyps do not receive the benefit of voice therapy. In this way the aspect of patients' satisfaction of his voice could be studied.

Habit formation of hyperfunction voicing is an area which warrants exploration. The length of time the patient needs to exhibit improper voicing before this pattern becomes a habit needs investigation. Prior research (Boone, 1972, 1977; Wilson, 1977) indicates that two months of vocal abuse is sufficient to create vocal fold pathologies. This study supports this assumption, however, a shorter period of poor voicing pre-surgery was not investigated.

The question of how many therapy sessions are needed for remediation of poor vocal habits to occue is also unknown. This study indicated that one session is not adequate. Additional research is needed to identify more precisely the number of sessions which are typically required to achieve "therapy."

SUMMARY

The goal of vocal rehabilitation for patients with vocal cord pathologies is the restoration of a comfortable, serviceable, longlasting voice to the patient (Brodnitz, 1963). In this study, the effects of two remediation techniques were compared: (1) the physician's verbal advice only, and (2) the physician's verbal advice and voice therapy.

The medical files of 68 subjects who had undergone surgical removal of vocal nodules/polyps were examined. Ratings were assigned to the physical condition of the vocal folds for each post-surgical laryngoscopic examination. All subjects had at least a two month history of vocal abusive behaviors. The two groups, treatment and control, were compared for frequency of recurrence of vocal nodules/polyps.

As predicted, patients who received voice therapy had significantly fewer recurrences of vocal fold pathologies than similar patients who received physician's advice alone.

In addition, it was observed that one voice therapy session was not adequate for remediation of poor voicing habits. Within the treatment group, five of the eight subjects who exhibited

recurrences had voluntarily terminated therapy after only one session. Since the duration of poor voicing pre-surgery was similar in both conditions it can be assumed that one session of voice therapy was not sufficient to prevent recurrence of the pathology.

The implications of this study are that voice therapy is a viable and successful treatment for patients who have undergone surgical removal of vocal nodules/polyps and have chronic histories of vocal abuse.

APPENDIX A

Helping Your Voice To

Get Better

by
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INTRODUCTION

Your doctor has diagnosed you as having a voice problem. There are many causes of voice problems, but several changes in your talking habits may improve your voice. Perhaps your physician will decide that a voice therapist may help you, or you require surgery, or voice rest, or that you have a voicing habit that needs to be changed. You may need 'some' or 'all' of the above.

What's important FIRST is that you need some information about your voice because YOU will be helping to make it better. We would like to put you to work right away as a member of your own rehabilitation team.

There are several things that you can do to help your voice. If you will do them, you can save yourself both time and money. In fact, it would be difficult to improve your voice without your help.

Your voice belongs to you, and you will be in charge of most of the changes; however, you will need some information or training first. That's what this pamphlet is all about.

There are three parts to the pamphlet.

(1) How normal voices are made,

(2) How people hurt or 'abuse' their voices,

(3) Getting your voice back to normal.

HOW NORMAL VOICES ARE MADE

At least part of your voice problem is caused by vocal abuse. This means that you have been 'misusing' your voice. The first step in learning to use your voice without hurting it is to learn how normal voicing is done.

Before you make a voice, you must take air in, then as it comes out, it will pass over the vocal cords or folds and vibrate them. Now you are making a voice. This basic sound may be changed into different vowels in your mouth and nasal cavities. Now let's look more carefully at these steps.

Taking Air In - "Inhalation"

When you make sounds for talking like "aah" or "ooo", you begin by taking air in:

(1) Through your nose

(2) and mouth

(3) then the air goes down through the top part of your air tube (voice box)

(4) down through the lower part of the air tube (trachea)

(5) and finally to your lungs.

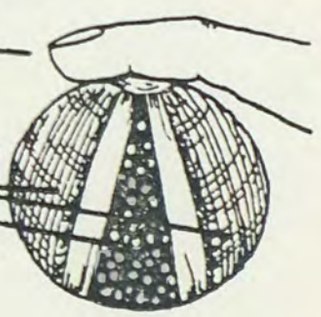
Getting The Air Out - "Exhalation"

If you look at the drawing on the previous page, you will see that the air in the lungs may go back up and out through the same tubes and areas it came in through. As the air leaves the lungs it is under pressure and flows up the air tube (4) through the larynx, (3) and out through your mouth, (2) or nose, (1) (see picture).

Making A Voice - "Phonation"

The air goes in - the air goes out. That's breathing or respiration. Your VOICE happens when the air comes up through the larynx and vibrates the vocal folds.

Now here's the important part. Put your finger on the small bump at the top of your larynx (sometimes called the adam's apple). Your finger is near the top of the air tube and the vocal folds.



If we could look down the throat to see the top of the tube behind your finger, we would see two small pieces of skin stretched across the tube. Air may pass through the opening. Remember, we're looking down the air tube.

The vocal folds move back and forth - they open and close. When they move together, the air tube is closed.

When the folds move apart, they open wide and lots of air may go in or out.

The folds open and close rapidly many times while you say "aaaaaaaaaaah".

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Making Pitch Changes - The vocal folds may stretch out from front to back so they become long and thin. (Which makes the pitch of your voice rise.

When muscles in the vocal folds relax, the folds get loose and thicker, and when they vibrate this makes the pitch lower.

There is a BEST pitch range for everyone. It is determined mostly by the size of your vocal folds.

Your vocal folds make many complicated changes as you talk; (a) the pitch goes up and down and the vocal folds 'stretch out' or 'relax', (b) the folds vibrate and, (c) the folds open and close.

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HOW PEOPLE HURT OR 'ABUSE' THEIR VOICES

It is hoped you have enough ideas now so you may begin to understand what may have caused your voice problem. Any time there is too much or too little tension in the muscles in the breathing or phonation areas we have talked about, there may be vocal abuse. The vocal folds and the muscles which control them may also tighten and the vocal folds may become reddened, swollen or develop callous-like bumps.

When the vocal folds come together and close, they actually touch all along the middle edges. If you are making a voice normally, the vocal folds come together gently. If you are 'hurting' the vocal folds, you are probably making your voice so the vocal folds go together too hard. And this is what vocal abuse is all about; voicing habits that hurt the vocal folds.

Consider this example. Imagine you did not rake leaves very often. Suddenly you found that you had to rake leaves for an entire day. At the end of the day you would probably have sore hands with redness, swelling and blisters. This would happen because the skin was abused; it was rubbed and scraped. If you kept on raking for a few days, hard callouses would develop as protection against the rubbing.

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The skin on your vocal folds is the same as the skin on your hands. If vocal fold skin is rubbed, bumped or abused, it will redden, thicken and "blisters" will form. The "blister" will be soft at first and then get hard if the abuse of the vocal folds continues. So your job is to find out how you have been hurting your voice and then eliminate the abuse. Then the problem won't happen again. Here are some examples of some types of problems and their causes.

(1) Thickening and Reddening of the Vocal Folds and Vocal Nodules

If you (a) yell, (b) talk often in a loud voice, (c) cough or clear your throat often and hard, (d) use 'unusual' or tense voices during play or anger, or (e) use a pitch that is too high or too low, you are hurting your vocal folds. Also, if you are a very tense, nervous person under pressure, the tension may focus in the neck, shoulder or laryngeal area. In most of these situations the vocal folds slam together during voicing.

These problems begin with one of the above vocal abuses and result in thickening and redness. If the vocal abuse continues, the thickening near the middle of the fold may develop into a blister or nodule. In severe conditions a nodule may be present on both folds.

(2) Contact Ulcers

Contact ulcers are similar to vocal nodules in that they are both "between the vocal folds". Contact ulcers, however, are small growths at the back of the vocal folds. There may be only one or one on each vocal fold.

The causes are also different; (a) this problem is connected with loud or hard voicing when the voicing starts, (b) frequent lifting or straining during voicing, (c) 'authoritative voicing'. Occasionally, medical problems cause contact ulcers.

(3) Laryngitis

Laryngitis may result from infection from a cold or flu, vocal abuse such as yelling at a football game, or both. The vocal folds become thickened and red. As the laryngitis gets worse, it becomes harder and harder to voice. If you insist on 'speaking over' the laryngitis and not resting your voice, it will get worse. You should also consider coughing and throat clearing as vocal abuse.

If appropriate, your physician or speech pathologist will discuss other pathologies with you. However, at this point it is important for you to understand that many types of vocally abusive behavior can cause vocal fold problems. If you are really going to solve the problem, you will want to eliminate these causes. Your physician and speech pathologist will help.

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GETTING YOUR VOICE BACK TO NORMAL

What will you need to do to get the vocal folds back to normal?

(1) If you have not seriously damaged your vocal folds, your physician or speech pathologist may help you eliminate the vocal abuse. Treatment usually consists of finding out what vocally abusive behavior you may be using, and then helping you to replace this behavior with normal voicing.

(2) If the condition is slightly more serious, you may be advised to have a week or two of complete voice rest. This means NO voicing at all, limit any coughing, throat clearing, and no whispering. If your doctor recommends complete voice rest, plan ahead for that week so you are not in situations which 'demand' speech. You may have to change your lifestyle somewhat for a week, so prepare yourself.

Complete voice rest is inconvenient, but it is prescribed for a good reason.

You will recall that during voicing, your vocal folds come together and touch many, many times. The skin on the area that touches is injured and needs to heal. If you had a cut on the palm of your hand, you would probably not 'rake' for a week, but instead would let the skin heal. Your vocal folds are the same. They need rest and no rubbing so they can heal.

Good voice rest for two days followed by five minutes of voicing won't work. You are making an investment in something very important--your voice. Go 'first class'.

(3) In more serious cases the physician may choose surgery followed by voice rest. The surgery consists of gently scraping the added tissue or thickening from the fold or removing the nodule or growth from the vocal fold.

Many surgeons prefer to have their patients follow surgery with a week or two of complete voice rest. If your doctor tells you to follow this procedure, he wants to make sure the folds heal properly; so follow the previous directions for complete voice rest.

(4) Occasionally, a week of 'modified voice rest' is suggested. This plan allows for a minimum of talking and reduced or eliminated coughing or throat clearing. Talk only when absolutely necessary and only for short periods such as 30 - 60 seconds.

This technique is used when the condition of the vocal folds is fairly good at the beginning of treatment, or the folds may have improved as a result of complete voice rest.

Your doctor will choose the right treatment sequence for you. You may need only modified voice rest for a week or combinations of the other treatment techniques.

APPENDIX B

Five Steps in Voice Therapy

Discrimination. It is important for the patient to understand the difference between the correct and incorrect kinds of voicing (Boone, 1977; Brackett, 1971; Rubin and Lerhroff, 1962). Moore (1971), Wilson (1972), and Boone (1977) advocate a review of the normal processes of inhalation, exhalation, and phonation as a valuable reference point during the initiation of the rehabilitative sequence. Moore (1971) stated:

> Since vocal sound and the phonatory disorders are generated in the larynx, this organ offers an appropriate place to begin a detailed description of the mechanisms of voice production (p. 17).

A simplified description of the etiology and physiology of organic pathologies such as cord thickening, vocal nodules, and vocal polyps related to vocally abusive behaviors should be included (Boone, 1977; Moore, 1971; Wilson and Rice, 1977; Zwitman and Calcaterra, 1973). The explanation of the problem is followed by a technique described as ear training in which the patient learns to listen and discriminate the correct and incorrect behavior in others (Boone, 1977; Cooper and Nahum, 1967; Moore, 1971; Van Riper, 1972).

The goals of discrimination training are to help the patient understand (1) the physiology of normal respiration and phonation, (2) the etiology and physiology of organic pathology such as cord thickening, vocal nodules, vocal polyps, and their direct relationship to vocally abusive behaviors, and (3) the correct and

incorrect voicing behavior in others (Boone, 1977; Moore, 1971; Wilson, 1972; Wilson and Rice, 1977). In discrimination, the patient realizes when others make the error, but not when he does it (Brackett, 1971).

Confrontation. The purpose of confrontation is to create within the patient insight into his own error behavior so that he becomes motivated to change (Drudge and Philips, 1976; Mysak, 1970; Van Riper, 1972). The moment of confrontation provides the patient a unique communication experience. The assumption is that he will perceive his own error behavior, experience dissonance (Zajonc, 1970) or conflict (Lecky, 1969), and subsequently become motivated to change or search out a more appropriate response (Boone, 1977; Van Riper, 1972; Wilson, 1972; Zajonc, 1970). "We tend to learn most efficiently when our errors are immediately known to us (Holbrook et al., 1974, p. 298). Lecky (1969) discussed learning as a direct result of conflict:

> If it be true that learning is essentially a means of resolving conflicts, it follows that a conflict must always be present before learning can occur . . . and yet [human beings] [cannot continue to develop, or succeed in maintaining their unity, except by repeatedly facing new conflicts and risking the security] they wish to attain. Learning is not mechanical but adventurous (p. 104).

Confrontation is a special kind of communication based on inter and intra-circuit feedback principles (Barnlund, 1970). Both of these feedback circuits must operate to allow the patient

to (1) receive the environmental information, (2) analyze and form an opinion concerning the message, (3) engage in private interpretation of his own behavior as a result of insight, (4) realize that a balanced state does not exist (thereby producing tension), (5) become motivated toward the reinstatement of inner balance, and (6) engage in interpersonal communication to restore balance and reduce uncertainty (Barnlund, 1968, 1970; Zajonc, 1970). The patient uses inter-circuit feedback to process (a) the physician's advice, (b) the voice pamphlet, and (c) the discrimination training. Intra-circuit feedback is involved to create the awareness and understanding of the problem the same way that everyone else percieves it, e.g., the laryngologist, the patient's friends and family (Barnlund, 1970). This is why the verbal or written advice model may not work. The dissonance either is not created, or the patient engages in avoidance behavior and does not switch to intra-circuit feedback to allow confrontation (Howe, 1963; Lecky, 1969; Zajonc, 1970).

When the communication between the speech pathologist and the patient proceeds successfully, the patient (1) understands what the problem is, (2) is able to gain insight and confront himself with the problem, and (3) becomes motivated to search out the correct response (Boone, 1977; Moore, 1971; Van Riper, 1972; Wilson and Rice, 1977).

Searching. When confrontation has been successful, vocal

rehabilitation returns to the advice model to help the patient locate a better voice (Boone, 1977; Brackett, 1971; Drudge and Philips, 1976; Moore, 1971; Wilson, 1972; Wilson and Rice, 1977). Lecky (1969) postulated that the:

> ability to foresee and predict environmental happenings, to understand the world one lives in, and thus be able to anticipate events and prevent the necessity for sudden readjustments is an absolute prerequisite for the maintenance of unity. The subject must feel that he lives in a stable and intelligible environment in which he knows what to do and how to do it, and his attitude of confidence and certainty is supported by this conviction (p. 84).

In the process of learning about his environment, the patient gradually develops vocally abusive behaviors, or habits over time (Ballantyne and Groves, 1971; Boone, 1977; Moore, 1971; Wilson, 1972). When a stimulus event conflicts with this predicted frame of reference, incongruency occurs, and the system is challenged (Lecky, 1969; Zajonc, 1970). In this anxious state, the patient seeks to re-establish balance (Zajonc, 1970). Barnlund (1968) considers the rehabilitative process a learning experience in which the clinician helps the patient to clarify and interpret the conflict and make an appropriate adjustment. Lecky (1969) believes that in the rehabilitative situation, the patient "finds strength and support which enables him to assimilate experiences which he could not assimilate before" (p. 122). Gibb (1961) talked about facilitative communication in which the clinician is open, friendly, interested, accepting, and non-

evaluative. This non-defensive model is supported in theory by Howe (1963) and Barnlund (1968). Communication is encouraged to help the patient gain insight into his problem and organize his self-concept.

Searching techniques are facilitative in that they provide opportunities for the production of a better voice (Boone, 1977; Zwitman and Calcaterra, 1973). Boone described the use of these techniques:

> As part of every clinical session, we must probe and search for the patient's best voice. When an acceptable production is achieved, we use it as the patient's target model in therapy. The patient's own best voice becomes his goal (p. 101).

In a 1976 study, Drudge and Philips demonstrated the process of learning and shaping of behavior in voice therapy. Results revealed that:

> (1) the client's behaviors in this vocal rehabilitation program reflected a learning process; (2) facilitating techniques were used to modify or shape behavior through successive approximations to the terminal goal; (3) self-evaluation is an important factor needed to bring about successful changes in behavior; (4) analysis of client's behaviors in relation to the learning process can aid in evaluating the effectiveness of the facilitating techniques; and (5) from such evaluation intraclient and interclient program changes are derived hopefully resulting in a greater success rate and maximum benefits from time spent in therapy (p. 398).

Successive searching behaviors allow the patient to locate the target, or good voice (Boone, 1977; Dickson, 1974; Van Riper, 1972; Wilson and Rice, 1977).

Stabilization. Once the patient understands his voice problem and demonstrates the ability to produce a more appropriate response, stabilization of his new voice is initiated (Brackett, 1971; Wilson, 1972). It is important to realize that this new response (the new voice) is very delicate and elusive (Boone, 1977; Van Riper, 1972). Practice for the new voice during repetition of vowels is used to strengthen the response. The patient learns the "feel" of the new behavior during the most comfortable situations (Boone, 1977). Hilgard and Marquis (Kimble, 1968) defined this learning as "a relatively permanent change in behavior potentially which occurs as a result of reinforced practice" (p. 6). After achieving the simple vowel level, the patient may progress from easy to difficult vocal situations (Van Riper, 1972). This hierarchial progression is from vowels to words to phrases to sentences (Boone, 1977; Rubin and Lerhroff, 1962). Holland (1967) presented two basic rules regarding approximations:

> (1) Begin with a form of behavior which the learner is fully capable of emitting and (2) move rigorously and precisely in small steps from this initial performance, differentailly reinforcing each step, to progressively closer approximations of the desired final behavior (p. 11).

Generalization. In this fifth and final step of the hierarchy, the patient attempts to "carry over" his new voice into his external environment (Brackett, 1971; Wilson, 1961, 1972). Brackett defined this sequence:

> Once the client understands the parameters of his his own vocal profile and demonstrates the ability to change the functions of structures toward a more desirable use, therapy is directed toward the stabilization of appropriate vocal characteristics and the application of these to communicating with the environment (p. 461).

Lecky (1969) views this final stage as an acceptance. The patient has gone through a process of "revision and reorganization" (p. 123) and thus learning has taken place. Festinger (1957) would define generalization as the final step in restoring balance and thereby reducing dissonance.

The plan of the rehabilitative sequence is to change the patient's existing cognitive elements, attitudes, and values about his voice (Boone, 1977; Van Riper, 1972; Wilson, 1972; Zajonc, 1970). According to Barnlund (1968), the new voice evidences the success of the communication technique:

> Interpersonal communications are regarded as therapeutic when they provoke personal insight or reorientation, and when they enable persons to participate in more satisfying ways in future social encounters (p. 614).

APPENDIX C

Data Profile

DATA PROFILE

T # _____ C # pre _____

Physician _____ File # _____

Age _____ Sex _____ Phone _____

Prior vocal fold surgery Yes _____ No _____

If Yes: Date _____ Pathology _____

Physician estimate of presurgery voice _____

Surgical date _____

ENT vs. pathology report _____ / _____

Physicians advice/recommendations _____

Etiology _____

Post - op rechecks:

Date	Physicians Findings	Condition Rating
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

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