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A Survey of Vocal Characteristics in a Sample of Adult Rheumatoid Arthritics

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A SURVEY OF VOCAL CHARACTERISTICS IN A SAMPLE OF ADULT RHEUMATOID ARTHRITICS

by
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This thesis submitted by Janine B. Chenier in partial fulfillment of the requirements for the Degree of Master of Arts from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.

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This thesis meets the standards for appearance and conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

William Johnson
Dean of the Graduate School

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Signature Janine B. Chenier

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ABSTRACT

The normalcy of voicing at the level of the larynx is dependent upon the competency of the cricoarytenoid joints to which the vocal folds are attached. Rheumatoid involvement of this diarthrodial joint could result in reduced mobility or fixation of the fold(s).

Medical authors hold differing opinions of the nature and frequency of voice change due to the pathology known as cricoarytenoiditis. The term "hoarse" has been widely used to describe the characteristic alteration of phonation in a population of rheumatoid arthritics.

It was the purpose of this study to survey a sample of adult rheumatoid arthritics in order to describe the acoustic characteristics of their phonation and to relate these findings to arthritic involvement of the cricoarytenoid joints as diagnosed by indirect laryngoscopy. Another purpose of the study was to determine which vocal parameters were most predominant when the voices were perceived as "hoarse."

The data were collected by means of a questionnaire completed by thirty-one subjects diagnosed with rheumatoid arthritis. Indirect laryngoscopy was performed on all subjects in order to assess the presence or absence of visible evidence of rheumatoid involvement of the cricoarytenoid joints. Voice samples were obtained from each

subject and coded independently with the Voice Profile (Starr and Wilson, 1976) by three judges.

Results indicated that "hoarseness" was perceived in 64.5 percent of the sample. This "hoarseness" was characterized by a lowered pitch and variable amounts of breathiness which was inversely proportional to the amount of "hoarseness." While 45 percent of the subjects reported three or more associated laryngeal symptoms, only 12.9 percent were diagnosed with cricoarytenoiditis. Voice analysis in such a limited sample did not permit description of the characteristic voice change associated with cricoarytenoiditis. The transient nature of such voice pathology further hindered the results of this study.

In conclusion, it is suggested that more specific research be designed in order to assess the voice pathology at the time voice problems are occurring in subjects already diagnosed with cricoarytenoiditis.

CHAPTER I

INTRODUCTION

The voice component of verbal communication is the end result of a phonatory process consisting of 1) a respiratory driving force which determines the sub-glottic air pressure, 2) a source of vibration that is the vocal folds, and 3) the resonating cavities. The vocal folds which supply the vibratory source are attached to the arytenoid cartilages and the functioning of the cricoarytenoid joint is critical to the movement and efficiency of the folds. The cricoarytenoid joints are true diarthrodial joints with ligamentous capsules lined by synovial membrane.

Rheumatoid involvement of the larynx commonly affects the cricoarytenoid joints.

> Acute synovitis of these joints causes oedema and loss of mobility of the vocal folds with narrowing of the glottic chink, resulting in laryngeal obstruction . . . . Chronic involvement with joint fibrosis leads to reduced mobility or even to fixation of one or both vocal folds in the midline position (Webb and Payne, 1972, p. 123).

It was the purpose of this study to survey a sample of adult rheumatoid arthritics in order to describe the acoustic characteristics of their phonation and to relate these findings to arthritic involvement of the cricoarytenoid joints as diagnosed by indirect laryngoscopy. Judgements of perceived "hoarseness" as it related to their vocalizations was correlated with the sub-categories of the Voice

Profile (Starr and Wilson, 1976) in an attempt to describe the "hoarseness" associated with cricoarytenoiditis.

Review of Literature

The definition of what characterizes "normal" vocal production varies depending upon the perceptual hearing set of the diagnostician (Moody, Montague and Bradley, 1978). One form of vocal abnormality at the level of the larynx has been referred to, by both the medical profession and speech pathologists as "hoarseness." Moore and Thompson (1965, p. 97) described hoarseness as ". . . a phonatory phenomonon, i.e., it is produced by the laryngeal sound generator . . . a result of some sort of abnormal vibration."

Boone (1977, p. 94) relates hoarseness to ". . . anything that interferes with optimum vocal fold adduction." Both Darley (1965) and Fairbanks (1960) consider hoarseness to be a combination of the acoustic elements of harshness and breathiness with either element predominating within a given voice. Harshness is the result of hard glottal attacks which may cause a lowering of pitch and weakening of intensity. Breathiness pertains to the escape of sub-glottic air during phonation due to poor approximation of the vocal folds. This continuous flow of air, according to Fairbanks (1960, p. 179), may cause ". . . a person to have limited vocal intensity and low pitch." Moore (1957) differentiated among three types of hoarseness: 1) dry, characterized by relatively loud breathiness; 2) wet, similar to the voice we hear in laryngitis, and 3) rough, a complex vocal disorder characterized by two voice pitches produced simultaneously. Wilson (1978) felt

that the quality of hoarseness was usually associated with ". . . lowered pitch, tension, and breathiness."

The quality of "hoarseness" covers a broad range of vocal characteristics which research indicates is influenced by the nature of the pathology of the larynx and vocal folds proper. It can then be conjectured that hoarseness in a population of rheumatoid arthritics may be characterized by a combination of acoustic elements different from those described in the literature. For example, since the mass and movement of the vocal folds are ultimately controlled by the function of the cricoarytenoid joints, deterioration of this joint as in rheumatoid arthritis (R.A.) could cause vocal abnormality. Limitation of gliding movement of the arytenoid cartilages resulting in fixation of the folds may cause varying amounts of airloss due to poor closure, while limitation of rocking motion could affect the function of the cricothyroid muscle and subsequently alter pitch. Phonation would likely be characterized by breathiness and lowered pitch as a result of such pathological change.

Medical Findings in Cricoarytenoiditis Related to Voice

Various medical authors have commented on the causes of "hoarseness" or its absence in rheumatoid involvement of the cricoarytenoid joints. Phelps (1966) stated that hoarseness was not due to adduction of the folds, only to the inflammatory involvement of the arytenoids. Vassallo (1966, p. 273) reported that ". . . hoarseness . . . results if both arytenoid cartilages become fixed in the midline as a result of arthritis . . . ." Bienenstock,

Ehrlich and Freyburg (1963) and Lofgren and Montgomery (1962) were in agreement with Vassallo's findings. Beckman and Wallen (1964) found that unilateral fixation or partial abduction gives varying degrees of hoarseness, while fixed partial adduction produces only slight hoarseness. Grossman, Martin and Root (1961, p. 534) claimed unilateral fixation would not produce significant hoarseness and stated ". . . from our clinical results it would appear that voice change is not a common finding in cricoarytenoid arthritis." In a study completed by Wolman, Darke and Young (1965, p. 403) however, ". . . indisputable evidence of the nerve degeneration and mobile cricoarytenoid joints was found, even though chronic inflammation of the joints was present in one of the cases."

In summary, the popular opinion of medical authors supports the belief that unilateral or bilateral rheumatoid fixation of the arytenoid cartilages in either an adducted or abducted positon will result in varying degrees of hoarseness. However, the nature of the resulting hoarseness is not commented upon, and no physiological explanations are offered for the affected vocal quality.

Symptomatology and Significant Findings in Cricoarytenoiditis

A distinction between the acute and chronic stages of cricoarytenoiditis is pertinent to this study since symptomatology differs depending upon the stage of the disease process. Beckman and Wallen (1964, p. 108) describe the acute stage as

> . . . all the classical signs of an acute inflammation, especially a feeling of fulness in the throat, foreign body feeling and pain on swallowing or speaking often radiating to

> the ears as a sign of vagal irritation. The accompanying hoarseness and stridor are probably due both to swelling and fixation of the cords. Laryngoscopically, there is a bright red swelling of the ary region . . . and true cords are likewise swollen and red, and the mobility of the cords is decreased.

Once the pathology becomes chronic in nature

> . . . in the late stages, the laryngoscopic appearance is fairly normal, apart from the decreased mobility of the cords, i.e., there are usually no gross derangements of the laryngeal structures.

In a study of one hundred subjects completed by Lofgren and Montgomery (1962) in which the diagnosis was based on case histories and laryngoscopy, the incidence of cricoarytenoiditis was twenty-six percent. Grossman, Martin and Root (1961) found evidence of cricoarytenoiditis by examination of the larynx in eighteen out of fifty-five cases (thirty-three percent). Bienenstock, Erhlich and Freyburg (1963) found that six cases in thirty-five showed physical signs of laryngeal abnormality (seventeen percent). The data collected by the above mentioned researchers consisted of laryngeal symptomatology subjectively reported by the patients as well as physical findings obtained by means of indirect laryngoscopy. All of the data were referred to as laryngeal symptoms.

For the purposes of the present study, references to associated (laryngeal) symptoms will exclude laryngoscopic findings. The physical findings resulting from indirect laryngoscopy will be reported separately.

Cricoarytenoiditis in its chronic stages is relatively common and occurs most frequently and more severely in females (Copeman, 1968; Lofgren and Montgomery, 1962). The overall duration of the

disease is less of a contributing factor to rheumatoid involvement of the larynx than is the general activity of the disease. Usually, increased activity results in a more active process in the larynx. Laryngeal examination is necessary if a positive diagnosis of cricoarytenoiditis is to be made.

Many arthritic patients may never be referred to an otolaryngologist. As Lofgren and Montgomery (1962) pointed out, patients tend to forget the laryngeal symptoms associated with cricoarytenoiditis because of the general pain they endure daily. These symptoms subsequently are not reported to the physician. Knowledge of the existence of a diarthrodial joint in the larynx which is subject to rheumatoid involvement is generally unknown to the layman. This point, though not considered in the literature, may be further reason why the patient does not attribute laryngeal symptoms to his arthritic condition. These last two points would contribute to the frequently undiagnosed disorder of cricoarytenoiditis and perhaps to the seemingly low incidence of associated voice pathology. Bienenstock, Ehrlich and Freyburg (1963) reported in their findings that while abnormal voice characteristics were present, laryngoscopic examination did not reveal arthritis of the cricoarytenoid joints. Vassallo (1966, p. 274) stated ". . . pathological involvement was found in a much greater proportion than clinical symptoms . . . in unselected cases at autopsy."

Other Variables as Causes of Voice Change

The vocal analysis of any population under investigation entails a consideration of a number of variables to which voice change

might be attributed. An investigation of the vocal characteristics of rheumatoid arthritics must take into account that arthritis is only one of the reasons that arthritics might display voice problems. They are subject to all of the general variables, but there are also specific variables which occur more commonly in such a population. These factors may have a significant bearing on vocal quality. General variables are inclusive of any ear, nose or throat pathology to which the general population are subjected and shall not be discussed at length in this paper. The general variables that are to be considered include 1) the incidence and frequency of smoking, 2) endocrine related changes, and 3) senescence of the voice. Specific variables considered are 1) Sjogren's Syndrome, a chronic inflammatory disease characterized by diminished lacrimal and salivary gland secretion, 2) the ingestion of a variety of disease related drugs and their subsequent effect on the larynx and vocal folds, and 3) the prevalence of depression in rheumatoid arthritics and its effect on vocal quality.

General Variables

The first general variable to be considered in the present study is that of smoking. In research completed by Gilbert and Weismer (1974, p. 228), the fundamental frequency of thirty female adults, half of whom smoked the other half who did not, was compared.

> Results indicated that . . . fundamental frequency values for the smokers were significantly lower than . . . for the non-smokers. Results of the laryngeal examinations for each subject revealed that 87 percent of the smokers examined exhibited some abnormality in appearance of the vocal folds.

> Generally, this abnormality consisted of a diffuse thickening of the vocal folds or an edematous condition within the larynx. Laryngeal examinations obtained from the non-smoking subjects indicated that only 7 percent of the examined subjects showed some evidence of laryngeal abnormality.

These results are essentially the same as those reported by Auerback, Hammond and Garfinkel (1970) who studied a male population. Collins et al. (1974) assessed airway obstruction in rheumatoid arthritic patients, and the results showed an increase in obstruction in those patients who smoked. The effect of smoking on vocal production for both males and females is the possible decrease in fundamental frequency perceived by the critical listener as a lowered pitch. Airway obstruction could produce a change in phonation in as much as it affects the function of the laryngeal aperture.

A second general variable to be considered is the effect of endocrine related changes and its relationship to vocal productions. Brodnitz (1971) surveyed a group of patients suffering from organic voice disorders. He found that in 14.4 percent of the female subjects the voice disorders could be traced to some endocrine cause. Bauer (1963) investigated a female population of 113 subjects and found that voice disorders in 15 percent were caused by hormone related drugs alone. A variety of drugs known as "anabolic steroids" which are prescribed by physicians contain androgen and estrogen or testosterone. These sex hormones are often used in cases of gynecological carcinoma, menopause or following hysterectomy (Brodnitz, 1971; Damste, 1964). These drugs may have a virilizing effect on the voice of female patients. The typical complaint of the female patient suffering from virilization of the voice is that

she considers herself to be hoarse ". . . the voice has become heavy, strange to her, is not under control" (Damste, 1964, p. 13).

Another possible cause of voice change is hormonal alteration prior to and during menstruation. Lacina (1968) observed ". . . loss of high tones, uncertainty of pitch and small submucous hemorrhages in 42 of 100 singers . . . before and during menstruation." Frable (1962, p. 68) stated that

> . . . vocal changes preceding the menses are unrecognized symptoms of premenstral tension . . . the decreasing estrogen concentration also causes increased permeability of fluid in tissue . . . these physiologic changes account for vocal changes . . . hoarseness, lowered vocal pitch and vocal instability.

Hormonal changes that occur in pregnancy also have their effect on voice. Imre (1968) ". . . found a high incidence of hoarseness and deepening of the voice accompanied by reddening and swelling of the vocal cords."

Thyroidism is an endocrine disorder which can affect vocal production. Soft tissues of the larynx like other body viscera may become subject to myxedema. "This non-pitting edema, termed myxedema, results from a quantitative increase in the amount of connective tissue present in the organs affected" (Ritter, 1964, p. 405). Authors agree that laryngeal myxedema produces a gradual and progressive hoarseness. Ritter's (1964) study showed the site of myxedematous infiltration was primarily in the submucosa of the vocal folds. Brodnitz (1971) described the voice affected by hypothyroidism as rough and hoarse; the voice characteristic of hyperthyroidism is described as husky, "broken-pot" and limited in range. He further stated that ". . . mild dysphonia may be traced to borderline degrees

of hypothyroidism" (p. 184). According to Bicknell (1973, p. 123), mild hypothyroidism is difficult to detect

> . . . a change in the character and quality of the voice may be the only factor in diagnosis. The chief complaint was a voice change usually a weak voice . . . . Other symptoms include a strain in talking, difficulty in singing, . . . deeper voice . . . dry irritating cough. A few actually complained of a hoarse voice. . . . a feeling of tiredness and shortness of breath were often mentioned.

The third general variable to be considered is voice changes related to aging. Segre (1971) states that a change in the speaking voice in women occurs following menopause (i.e., approximately age fifty) and the voice drops three or four tones thus becoming more masculine. Laryngeal senescence occurs in males from sixty-five to seventy years of age and in females from seventy to seventy-five years of age. "It is manifested in vocal fatigue, hoarseness and modification of various aspects of the voice . . ." (p. 64). The author explains further the effects of age on the physiological and anatomical changes perceived in pitch, intensity, continuity, modulation and color.

Specific Variables

One of the considerations in assessing vocal quality in a sample of rheumatoid arthritics is the incidence and consequences of "Sjogren's Syndrome." This disease also known as Sicca Syndrome may cause difficulty with chewing, swallowing, and phonation. The dryness may also affect the membranous lining of the nose, the posterior pharynx, and the larynx and may lead to hoarseness, among other problems. Half of the patients suffering from this syndrome have rheumatoid arthritis (Talal, 1972).

A second specific variable to be considered is the ingestion of disease related drugs. R.A. is a progressive inflammatory process causing joint deterioration. Medical management of the disease usually involves chemo-therapy and such ". . . drugs useful as anti-rheumatic and anti-inflammatory agents influence the metabolism of connective tissue . . ." (Woodbury and Fingl, 1970, p. 332). While the main drug action to be observed clinically with such preparations is that of reducing inflammation, the result hoped for is the return and maintenance of joint mobility and function. Steroid therapy is just one of the large number of alternatives in controlling R.A. There is, however, some disagreement over the effectiveness of steroids in the prevention or management of cricoarytenoiditis (Montgomery and Lofgren, 1963; Smith and Shine, 1964). Habib (1977) cited a case of successful intra-articular steroid injection in a patient suffering from acute R.A. of the larynx. Furthermore, ". . . euphoria and depression are frequent concomitants of pharymacological doses of glucocorticoids" (Thorn, 1974, p. 34).

The third specific variable of concern is the incidence of depression in arthritics. R.A. is classified as a long-term illness and ". . . psychological symptoms, particularly emotional depression, may dominate the clinical picture" (Brown, Bush and Felts, 1959, p. 111). In a statement by Brodnitz (1962, p. 283) ". . . vocal function and vocal quality are but the tools with which the mind, the personality, the emotions are expressed in vocal terms." In a study of ten patients hospitalized for mental depression, Hargreaves et al. (1965, p. 220) found

> Five of these showed a depressed voice reduced in loudness and often lacking in high overtones, giving their voice a dull, lifeless quality with diminished inflection. Their quiet voice did not always drop in fundamental frequency, but sometimes rose in frequency in a kind of pathetic whimper. In addition there were two or three patients who showed a depressed voice which was actually louder during depression and sometimes higher in pitch.

Such vocal changes in a sample of rheumatoid arthritics would not be surprising since the fluctuation of emotional state coupled with possible drug induced mood changes have potential effects upon this population. Furthermore, medications prescribed to counteract the state of mental depression may cause the side effect of "dry mouth" which has already been mentioned as having an effect on phonation.

Purpose of Study

The purpose of this study was to survey the vocal characteristics in a sample of adult rheumatoid arthritics and to describe the nature of vocal quality as it deviates from what a critical listener would consider "normal." The occurrence of voice change and its relationship to R.A. of the cricoarytenoid joints was also investigated. The incidence of cricoarytenoiditis in the sample was determined by means of indirect laryngoscopic examination. The Voice Profile (Starr and Wilson, 1976) was used in the task of coding voice samples in order to determine which characteristics appeared most frequently in those voices judged as "hoarse."

Research Questions

1. Is there a significant relationship between "hoarseness" and the various sub-categories of the Voice Profile?

2. Are there significant relationships between those subjects who reported an impression of voice change and their voice coding?
3. Is there a significant relationship between subjects who reported an impression of voice change and subjects diagnosed with cricoarytenoiditis by means of laryngoscopic examination?
4. Is there a significant relationship between subjects diagnosed with cricoarytenoiditis and the coding of vocal characteristics assigned on the Voice Profile?
5. Is there a significant relationship between the subjects who reported associated symptomatology and those who were diagnosed with cricoarytenoiditis?
6. Is there a significant relationship between those subjects who reported dry lining of the mouth and nose and the voice coding?
7. Is there a significant difference in the voice coding assigned to smokers and non-smokers?

CHAPTER II

METHODOLOGY

Subjects

In order to assess the vocal productions of a population of rheumatoid arthritics, sixty-seven patients attending the Rheumatic Disease Unit of the Health Sciences Centre in Winnipeg were randomly selected as possible candidates for this study. All of the patients were defined as definite rheumatoid arthritics, meeting the criteria established by the American Rheumatism Association. These sixty-seven patients were contacted by letter (Appendix I) from Dr. F. D. Baragar, Director of the Unit, informing them of the research project to be undertaken. The examiner then contacted each prospective subject by telephone and appointments were scheduled with those willing to participate in the study. A total of thirty-one subjects were subsequently assessed. None of the sample population was suffering any respiratory, laryngeal or nasal infections at the time of the survey. The data (voice samples, results of indirect laryngoscopic examination, and completion of the questionnaire) were collected over two consecutive half days; fourteen subjects were seen in the afternoon while the remaining seventeen were seen the following morning.

Apparatus

Approximately five days prior to the actual data collection, a cover letter (Appendix II) confirming the date, time and location

of the procedure was mailed to each subject along with a questionnaire (Appendix III) which was to be completed and returned at the appointment time. The questionnaire consisted of items related to the length and severity of R.A., medications taken, general health, smoking and drinking habits, hearing sensitivity, vocal use/abuse, associated symptoms of cricoarytenoiditis, and impressions of voice change. At the time of the data collection, each subject was given any assistance necessary to complete those questions that may have been left unanswered. Where many questions had not been answered, the completion of the schedule was carried out by phone within the next day or two following the assessment. In one instance, the examiner visited the subject at home to help with the completion of the form.

As a basis for the description of the acoustic characteristics of the voices of the arthritic subjects, voice sampling was carried out. The samples were obtained in an office on a patient ward at the Health Sciences Centre. Although the room was not sound treated, the area was relatively free from ambient noise which might have interferred with the taping. A Sony TC105A reel-to-reel tape recorder and Ampex LN3490 normal bias recording tape were used to record all voice samples. A mouth to microphone distance of approximately twelve inches was maintained during the collection of a one-minute start/stop sample of speech (Spack, 1977) during an impromptu monologue.

Each subject was seen by Dr. A. Gorenstein, who examined nasal and oropharyngeal structures and mucosa. He also performed an indirect laryngoscopic examination to assess the condition of the larynx and the movement of the vocal folds. The subjects were provided with a

written explanation of the study (Appendix IV) once they had completed the assessment.

Voice Coding

The judges (two graduate students and one undergraduate student in Speech Pathology and Audiology at the University of North Dakota) were selected for the coding of voice samples. All three had completed training in the use of the Voice Profile (Starr and Wilson, 1976).

Prior to the training session and the actual coding of the voice samples obtained for this study, each of the three judges was given a hearing evaluation which included pure-tone threshold audiometry and speech discrimination testing utilizing the CID auditory test W-22. All three judges achieved thresholds well within normal range and discrimination scores of ninety-eight percent to one hundred percent.

In order to assure a ". . . common frame of reference" (Moody, Montague and Bradley, 1978, p. 4) in coding voice samples, a training session was held during which the judges coded and discussed voice samples from a selected tape presentation from "Voice Disorders" (Wilson, 1972). Once there appeared to be a consistency in coding among the judges, scoring of the actual voice samples was undertaken.

The judges were seated at approximately four feet from each other and from the recorder. They were instructed not to discuss their codings or comment on the voice samples during the procedure. The judges coded fifteen additional voices which were randomly selected from the original thirty-one samples, so that intra-judge reliability could be established. The process took 1.5 hours to complete.

Voice Profile (Starr and Wilson, 1976)

The Voice Profile (Wilson, n.d.) was developed during a research project aimed at classifying voice cases in the school population. Wilson's intention of devising such a system was ". . . to find some systematic language that would permit consistent description" (p. 15). The profile (Appendix V) was modified by Starr and Wilson (1976) when they added six vocal characteristics on the profile form. The top portion of the form is divided into five sub-categories; each will be explained briefly.

Voice (Severity) Rating

An overall judgement of severity is scored. This rating is based on a scale of one to seven, one indicating the problem is barely perceptible and in the present study "normal"; seven indicating a severe disturbance in oral communication.

Laryngeal Cavity

This scale allows for measurement of the amount of openess of the folds and ranges from total aphonic production to the production of a whisper or to noticeable escape of air referred to as breathiness. The closed scale measures the amount of tension in the folds and ranges from extreme as in spastic dysphonia to noticeable tension. Pitch can be graded as too high or too low as judged by the critical listener or as ". . . sufficiently deviant to cause the individual to lose sexual identity" (Wilson, n.d., p. 17).

Resonating Cavity

This scale allows for the rating of hypernasality including assimilation nasality, nasality of vowels, and nasality of most sounds; hyponasality can also be noted. The measurement of throaty or gutteral and effeminate speech which Wilson and Starr (1976) added to the profile was not considered in the present study since descriptive information of its applicability was not made available to the judges during their training.

Intensity

This portion of the profile measures the appropriate loudness of voice.

Vocal Range

This sub-category deals with the variability of phonation.

The six vocal characteristics listed on the profile form can be noted as absent or present during the coding process.

The marking system at the bottom of the form which indicates the extent to which a deviant feature is noticeable was not used in the present study to simplify statistical computations.

In addition to coding voice samples with the Voice Profile, judges were required to make an additional decision of whether the vocal quality was "hoarse." If the vocal production was judged to be hoarse, the severity of hoarseness was scored as mild, moderate, or severe.

Starr and Wilson (1976) were the first to present any reliability data on the Voice Profile. The profile was used on a

population of school-aged children. The coding was performed by clinicians who were experienced in voice pathology, as well as others who were relatively limited in experience. The results obtained allowed the authors

> to conclude that this Voice Profile system can be used most reliably by individuals in tasks that require one to determine whether a voice feature is normal or deviant. When tasks require analysis of feature in terms of the subcategories contained in the profile (i.e., +3 closed, -2 pitch, etc.), reliability is reduced. Interlistener and intralistener performance for experienced and inexperienced listeners appear to be similar (p. 56).

Validity and reliability data on the Voice Profile were obtained by Moody, Montague and Bradley (1978) when the scale was applied to a group of Down's Syndrome children and a group of normal children. The eleven graduate students chosen as judges for that study were ". . . considered relatively sophisticated in the evaluation of voice disorders" (p. 4). Comparison of the Moody, Montague and Bradley (1978) study with previous independent voice analysis studies revealed the Voice Profile is a valid tool for the identification of voice disorders. In that study the vocal parameters of severity, open laryngeal cavity (airloss), closed laryngeal cavity (tension), and pitch were judged with high inter- and intra-judge reliability. Other parameters indicated non-significant reliability coefficients.

Based on these findings from the Starr and Wilson (1976) and Moody, Montague, and Bradley (1978) investigations, the present study involved application of the Voice Profile in the coding of the sub-categories of Voice Rating, Laryngeal Cavity, Resonating Cavity, Intensity, and Vocal Range.

CHAPTER III

RESULTS AND DISCUSSION

It was the purpose of this study to survey the vocal productions of a sample of adult rheumatoid arthritics and to describe the acoustic characteristics of phonation in cases of diagnosed cricoarytenoiditis. Another dimension of the study was designed to determine which vocal parameters contributed most predominantly to the quality of "hoarseness."

The data consisted of responses to a questionnaire completed by thirty-one subjects diagnosed with R.A. Diagnosis of cricoarytenoiditis was established by means of indirect laryngoscopy on all subjects. Voice samples obtained while the subjects spoke in monologue were independently coded with the Voice Profile (Starr and Wilson, 1976) by three judges.

The cover letter for the questionnaire is included in Appendix II. The questionnaire is included in Appendix III. The Voice Profile form is included in Appendix V.

The questionnaire which was completed by all the subjects, took into consideration a variety of variables known to affect vocal production. The occurrences of those variables found to be noteworthy will be presented to describe the sample surveyed.

As displayed in Table 1, fourteen males and seventeen females participated in this study. The average age of the subjects was 56 years (range: 20 years to 77 years). The average duration of illness was 13.9 years (range: 4 years to 45 years).

TABLE 1

SEX, AGE, AND DURATION OF ILLNESS FOR RHEUMATOID ARTHRITIC SUBJECTS SURVEYED

Descriptive Data	N	Mean Years
Total Number of Subjects	31	
Females	17	
Males	14	
Age		56
Duration of R.A.		13.9

Questionnaire Results

In response to questions pertaining to the use of medically related drug usage, nine subjects reported the use of some type of anti-depressant medication and in eight of these subjects the prescription had been used on an intermittent basis, as necessary, over a period of years; the dosage of the medication was reportedly "light." The remaining subjects had been taking a heavier dosage for a two-month period to treat acute depression. Only two subjects were taking Premarin, which is classified as a sex hormone and none reported current thyroid problems or the use of thyroid medications. Thirty

of the subjects were taking one or more forms of anti-inflammatory agents.

Of thirty subjects who responded to questions on hearing sensitivity, seventeen stated they had had their hearing tested at some point in the past, while thirteen claimed their hearing had never been tested. Six subjects reported a diagnosed hearing loss and one of these six had been fitted with a hearing aid. Six subjects stated they suspected they were suffering from a hearing loss.

Other questions revealed the following information: Eighteen subjects claimed they suffered from both dry lining of the mouth and nose. Allergies which affected the respiratory system were noted by two subjects. Eight respondents reported smoking cigarettes, six of these for a period of twenty-five to forty years averaging a pack a day. Twenty-three subjects considered themselves social drinkers, five stated they were daily consumers of alcohol. (Three subjects did not respond.)

One portion of the questionnaire was designed for female subjects only and revealed the following data: Three subjects had undergone hysterectomies, twelve were experiencing or had already experienced menopause and one subject was menstruating. (One subject did not respond.) Of the nine women who responded, none was ever aware of any voice change related to fluid retention as a result of menstruation. Of the five women who responded, none had noticed a voice change during past pregnancies.

Among the responses to voice change related to psychological influences, none of the thirty-one subjects noted any voice change

during periods of depression. One subject reported being in a state of depression at the time of the data collection; however, her voice coding reflected no abnormality. While it is acknowledged that the method of data collection and voice sampling could create an added element of tension, only two subjects reported feeling somewhat nervous about their particiaption in the study.

Another portion of the questionnaire served to collect information regarding laryngeal symptomatology. Among the subjects of the present study as presented in Table 2, seventeen subjects reported shortness of breath (dyspnea) with a minimum of physical exertion; nine reported noisy throat breathing (stridor); ten suffered pain in the throat (without respiratory infection); five stated this pain occasionally traveled to the ears; nine reported a sensation of fullness or tension in the throat; and eight had difficulty swallowing (dysphagia). Six subjects were of the opinion that their vocal quality had undergone some change but that the change was of a transient nature. All six agreed that the change was only apparent to them following the onset of R.A. Four of these six subjects were aware of the voice change regardless of the activity of the disease process, that is, the change was noted whether or not a flare-up of R.A. was taking place. Five of these six subjects could not identify any systematic pattern as to when their voice sounded better or worse. Three of the subjects were of the opinion that increased talking resulted in weakening of the voice. Five of these six subjects responded to a separate request for information (Appendix VI) regarding their impression of voice change. Three of them felt the pitch was

TABLE 2

OCCURRENCE OF ASSOCIATED SYMPTOMATOLOGY REPORTED BY THIRTY-ONE SUBJECTS SURVEYED

Dyspnea	Stridor	Dysphagia	Fullness In Throat	Throat Pain	Pain Radiating To Ears	Subject's Opinion of Voice Change
17	9	8	9	10	5	6

lowered, while one felt it was higher. Two subjects concurred on the feelings of the voice being both "whispery" and "strained." Two other subjects described the quality as "hoarse." One specifically related his hoarseness to cold weather situations. Table 3 presents the frequency of occurrence of associated symptoms as reported by subjects who described subjective impressions of voice change.

The subjective method (questionnaire) used in the present study to obtain information regarding numerous variables to which voice change could be attributed necessitates cautious interpretation of the data. For example, the high incidence of ingestion of anti-inflammatory agents would possibly control or mask the problem of cricoarytenoiditis. The incidence of R.A. in a general population is stated in the literature as a ratio of four to one female to male and cricoarytenoiditis is more prevalent in females. The random sample of the present study does not represent a general population of arthritics since forty-five percent were male. Another point to be considered is that of hormonal changes due to menopause and hysterectomy. Three women had undergone hysterectomies and twelve were experiencing or had gone through menopause. Seventy-four percent of the sample were between fifty and seventy-seven years of age, thus vocal change related to age could be a significant factor. Other variables such as dry lining of the mouth and nose, ingestion of other medications mentioned or possible undiagnosed health problems (i.e., hypothyroidism, allergies, hearing deficits, etc.) cannot be ruled out as possible causes of voice change.

TABLE 3

ASSOCIATED (LARYNGEAL) SYMPTOMS REPORTED BY SIX SUBJECTS
WHO REPORTED VOICE CHANGE

Hoarseness As Perceived By Subjects	Dyspnea	Stridor	Dysphagia	Fullness In Throat	Throat Pain	Pain Radiating To Ears	Positive R.A. Findings
2	3	2	3	3	4	2	1

Results of Indirect Laryngoscopy

Indirect laryngoscopic examination was performed on all subjects. Physical findings were reported on nasal, oral, and laryngeal structures. For the purposes of this study, only those findings relevant to rheumatoid changes of the larynx will be discussed. Eleven of the thirty-one subjects exhibited some abnormality of either the vocal folds or adjoining laryngeal mechanism, but only four of these (12.9 percent) presented physical findings consistent with rheumatoid changes in the cricoarytenoid joint. In two other subjects, the findings of restricted cord mobility could not be positively attributed to such involvement. Discussion of these findings will be offered later in the text.

Inter- and Intra-Judge Reliability of the Voice Profile (Starr and Wilson, 1976)

The Voice Profile was used to code the voice samples obtained from each subject. Inter- and intra-judge reliability studies were carried out for the seven parameters of voice outlined in the profile as well as for the judgement of hoarseness. Table 4 displays the reliability coefficients obtained.

Inter-judge reliability studies revealed non-significant correlation coefficients ($p > .05$) for the parameters of voice rating, resonance and range. Moderately positive and statistically significant reliability coefficients were obtained for the parameters of pitch, breathiness, tension and intensity The added judgement of perceived hoarseness showed the highest significantly positive coefficient ($r = .77$).

TABLE 4

INTER- AND INTRA-JUDGE RELIABILITY COEFFICIENTS FOR VOCAL PARAMETERS OF THE VOICE PROFILE AND FOR HOARSENESS

Parameters Of Voice	Inter	Intra
Voice Rating (Severity)	.26	.62**
Pitch	.64**	.92**
Breathiness	.58**	.86**
Tension	.59**	.69**
Resonance	.33	Zero Variability
Intensity	.36*	.84**
Range	.006	Zero Variability
Hoarseness	.77**	.72**

*significant at the .05 level
**significant at the .01 level

Intra-judge reliability coefficients were obtained by having the judges recode fifteen randomly selected voice samples from the original thirty-one samples. All reliabilities were significant at the .01 level. Moderately high reliability coefficients were obtained for voice rating and tension while high correlations were obtained for ratings of pitch, breathiness, intensity and hoarseness. These vocal parameters could be most heavily relied upon when description of abnormal voicing was undertaken in the course of the present study. The parameters of resonance and range showed zero variability and, therefore, correlations could not be calculated.

Inter- and intra-judge results of the present study are compared with the results of the Moody, Montague, and Bradley (1978) study in Table 5. Although they are not as highly significant, the results of the present study do parallel Moody, Montague, and Bradley's (1978) results rather closely. The main point of disagreement appears in the voice (severity) rating for inter-judge listening. The non-significant coefficient of .26 in the present study is attributed to the fact that one judge consistently scored higher on severity than did the other two judges. This may have been the result of this judge's expectation that most voices presented would be deviant.

It should be noted that the parameters of intensity and range allow for one of three possible decisions on the listener's part; either normal, excessive or limited. This lack of variability among ratings can also be observed in the assessment of opened and closed positions of the laryngeal cavity. Identical voice codings could result despite the fact that the noted features may exist in varying amounts from one subject to another. Without use of the marking system to distinguish such differences, the Voice Profile loses its full potential for descriptive analysis of the deviant or abnormal voice.

The six voice characteristics listed on the center of the profile were noted by the judges but were not computed in inter- and intra-judge reliability studies. While there appeared to be inconsistency in the judgement of abnormal vocal characteristics, there was agreement between at least two judges that diplophonia, whether consistent or intermittent in nature, existed in fifteen of

TABLE 5

COMPARISON OF INTER- AND INTRA-JUDGE RELIABILITY COEFFICIENTS IN THE PRESENT STUDY AND THE MOODY, MONTAGUE AND BRADLEY (1978) STUDY ON PARAMETERS OF VOICE RATING, PITCH, BREATHINESS AND TENSION

	Intra-Judge		Inter-Judge	
	Present Study	Moody Montague Bradley (1978)	Present Study	Moody Montague Bradley (1978)
Voice Rating	.62**	.96	.26	.97
Pitch	.92**	.94	.64**	.92
Breathiness (Airloss)	.86**	.91	.58**	.91
Tension	.69**	.92	.59**	.92

**significant at .01 level

the thirty-one subjects (48.3 percent). This finding could account for the quality of hoarseness referred to by Moore (1957) as "rough" due to the simultaneous production of two vocal pitches.

Each of the seven parameters of the profile were coded by three judges. The severity scale revealed the greatest amount of inconsistency between the judges and in order to differentiate normal from deviant voices, the first two ratings on the scale were combined to form one group of fairly normal sounding voices while the next three ratings formed a second grouping of voices that were judged as noticeably deviant. The last two ratings of the severity scale were not used by the judges to code any of the subjects and were, therefore, omitted. In selecting the voice coding to be recorded for statistical computations, the coding upon which at least two judges agreed was used while the third coding was discarded. The amount of hoarseness was not recorded specifically but instead was used to make a dichotomous decision as to whether or not hoarseness was subjectively perceived.

Statistical Analysis

The Voice Profile used to code the sample voices collected for this study consists of seven parameters, namely voice rating (severity), pitch, openness of laryngeal cavity, closed laryngeal cavity, resonance, intensity and range. It was hypothesized that the subjective quality of hoarseness would correlate positively with the three parameters which constitute the laryngeal cavity. The laryngeal cavity includes the parameters of pitch, breathiness (open), and

tension (closed). Correlation coefficients as presented in Table 6 were computed between twenty subjects who were judged as "hoarse" and the coding they obtained with the profile. Significant correlations ($p < .05$) were revealed for the parameters of voice rating ($r = .37$) and pitch ($r = .40$) while breathiness had a negative correlation ($r = -.41$). No other significant correlations were obtained. These results indicate that a judgement of hoarseness implied an alteration of voice such that a decrease or lowering of pitch would be apparent in perceived hoarseness. Breathiness or airloss was related to the severity of hoarseness such that as hoarseness increased breathiness decreased. The overall severity rating did single out those voices that were noticeably hoarse.

TABLE 6

CORRELATION COEFFICIENTS BETWEEN HOARSENESS AND THE VOCAL PARAMETERS OF THE VOICE PROFILE

Parameters of Voice	Correlation Coefficients/Hoarseness
Voice Rating	.37*
Pitch	.40*
Breathiness	-.41*
Tension	-.32
Resonance	.11
Intensity	.15
Range	Zero Variability

*significant at .05 level

The questionnaire completed by each subject revealed six people who felt that their voices had undergone some change. Correlation coefficients, as presented in Table 7, indicated a significant correlation ($p < .05$) of -.37 between coding of tension by the judges and impressions of voice change reported by the subjects. No other significant correlates were obtained. This lack of confirming judgements of voice abnormalities is not a surprising finding in view of the fact that all six subjects stated, at the time voice sampling was carried out, that they were not experiencing the voice change they had reported in the questionnaire. The voice change was described as transient, and no systematic pattern could be attached to its occurrence. This fact has considerable impact on the results of the present study since voice samples were obtained on one occasion only.

TABLE 7

CORRELATION COEFFICIENTS BETWEEN SUBJECTS WHO REPORTED VOICE CHANGE AND VOICE PROFILE CODINGS/HOARSENESS

Parameters of Voice	Correlation Coefficients
Voice Rating	.21
Pitch	.16
Breathiness	-.26
Tension	-.37*
Resonance	-.08
Intensity	-.12
Range	Zero Variability
Hoarseness	.08

*significant at .05 level

When a comparison of the six subjects reporting a personal opinion of voice change since the onset of R.A. was made with the four subjects identified by indirect laryngoscopy as having cricoarytenoiditis, a non-significant correlation ($p > .05$) was obtained. This would certainly support the statements made in the literature which claim that voice change can be present without positive findings of cricoarytenoiditis yet many more cases of pathology of this joint are found at autopsy than display clinical symptoms during life. Another factor worthy of consideration is that symptoms of inflammation which accompany acute R.A. may not have been present at the time of examination and chronic changes may not be visible if the involvement of the joint is in its early stages.

Indirect laryngoscopic examination performed on each subject in the present study revealed four individuals who exhibited positive physical findings consistent with rheumatoid changes of the cricoarytenoid joints. Table 8 presents the correlation coefficients obtained for those subjects on each of the parameters of the profile as well as for the judges' perception of hoarseness. A significant correlation of .39 for the parameter of intensity indicates that vocal production was found to be of a lesser intensity than normal in this particular group. This low correlation was attributed to the homogeneity of the group and the lack of variability of the scale (Ghiselli, 1964). In fact, only one of the four subjects was judged to have a volume of lesser intensity than normal while one other subject of the total sample was judged to have a volume of greater intensity than normal. A correlation of -.35 obtained for the

voice rating would be considered mildly significant ($p < .05$). Results indicate that despite positive laryngeal changes in cricoarytenoiditis, voice quality may not be remarkably affected. Hoarseness, described in the literature as a symptom associated with this pathology, was not found to be significantly related ($p > .05$) to membership in this group.

TABLE 8

CORRELATION COEFFICIENTS BETWEEN SUBJECTS WITH POSITIVE R.A. FINDINGS OF THE CRICOARYTENOID JOINTS AND VOICE PROFILE CODINGS/HOARSENESS

Parameters of Voice	Correlation Coefficients
Voice Rating	-.35*
Pitch	.16
Breathiness	.02
Tension	.15
Resonance	-.07
Intensity	.39*
Range	Zero Variability
Hoarseness	-.13

*significant at .05 level

Although forty-five percent of the subjects reported experiencing three or more associated symptoms that are thought to be consistent with R.A., there were no significant correlations obtained ($p > .05$) when this variable was correlated with the sample subjects diagnosed with cricoarytenoiditis. Associated laryngeal symptoms may

not necessarily indicate existing or imminent R.A. changes of the cricoarytenoid joints. On the other hand, perhaps pathology exists but is not yet visible through indirect laryngoscopy.

Eighteen subjects reported that they suffered from both dry lining of the mouth and of the nose. Correlation coefficients obtained for profile results and the hoarseness rating were not significant in this analysis. While no definite diagnosis regarding Sicca Syndrome had been made in the sample of subjects in the current study, there is the possibility that the problem existed in view of its reported high incidence in R.A. In any case, the effect of dry mucous membranes was not apparent from judgements of vocal production if indeed it was a factor.

Smoking was not shown to affect voice production. No significant correlations ($p > .05$) were obtained when the voice codings of smoking subjects were examined. Four of the subjects had positive laryngeal findings consistent with smoker's changes, described as erythema of the laryngeal mucosa or thickening of the cords. It would seem that such changes do not necessarily result in change or abnormality of vocal quality with this sample.

CHAPTER IV

SUMMARY AND CONCLUSIONS

The purpose of this study was to survey the vocal characteristics in a sample of adult rheumatoid arthritics and to describe the nature of phonation as it deviates from what a critical listener would consider "normal." The occurrence of voice change in relation to cricoarytenoiditis as determined by indirect laryngoscopy was also investigated. Since medical professionals describe as "hoarseness" the voice change heard in such a population, the Voice Profile (Starr and Wilson, 1976) was used in the task of analyzing voice samples to determine which characteristics appeared most frequently in those voices judged subjectively as "hoarse." Other information pertinent to voice quality was collected by means of a questionnaire. The following results were noted:

1. "Hoarseness" in a sample of adult rheumatoid arthritics consisted of lowered pitch and variable amounts of breathiness (airloss) inversely proportional to the amount of hoarseness.
2. Voice change as reported by subjects in the sample, could not be coded by the judges for analysis in view of the transient nature of the problem and the absence of its occurrence at the time of voice sampling.

3. There was no significant relationship between those subjects who reported a voice change and those who were diagnosed with cricoarytenoiditis by means of indirect laryngoscopic examination.
4. Voice change may or may not accompany R.A. of the cricoarytenoid joint. There was no relationship between "hoarseness," as perceived by the judges, in those subjects diagnosed with R.A. of the cricoarytenoid joint despite identification of noticeable voice change as measured with the Voice Rating scale of the Voice Profile.
5. The occurrence of associated laryngeal symptomatology did not predict the existence of R.A. of the cricoarytenoid joint as determined by means of indirect laryngoscopic examination.
6. No conclusions could be drawn regarding the effects of Sicca Syndrome since this disorder was not positively diagnosed in any of the subjects. The commonly reported occurrence of dry lining of the mouth and nose did not relate to any noticeable voice changes.
7. There was no significant relationship between the smokers and non-smokers as revealed by the voice codings done in the present study.

While 64.5 percent of the subjects were judged to be mildly to moderately hoarse, this hoarseness could not be attributed to cricoarytenoiditis. Of those subjects who did show laryngoscopic evidence of cricoarytenoiditis, the voice change was not necessarily

considered to be "hoarseness" as defined in the early part of this study. In view of the fact that only six subjects reported an awareness of voice change while twenty subjects were perceived as "hoarse" by the judges, it would seem that a voice change is not necessarily apparent to the individual in whom voice change can be identified by the critical listener. Perhaps this relates to the point made in the literature that many arthritic patients may have forgotten associated laryngeal symptoms of the past because of the general pain they endure daily (Lofgren and Montgomery, 1962).

It was concluded that further investigation is necessary if vocal production disorders in adult rheumatoid arthritics are to be described. Such research should be conducted by means of a longtitudinal design in a population diagnosed with cricoarytenoiditis who also exhibit noticeable voice alterations directly attributable to this pathology. It is further recommended that the subgroup of rheumatoid arthritics who experience voice change be studied at the time their voice problems are actually taking place. This would provide more adequate samples from which information could be obtained regarding those parameters of voice affected by the pathology.

APPENDICES

APPENDIX I

LETTER OF INTRODUCTION TO PROSPECTIVE SUBJECTS

The University of Manitoba
Faculty of Medicine

Rheumatic Disease Unit
Department of Medicine
Dr. F.D. Baragar
Dr. T. Hunter
Dr. R.E. Kaprove
Department of Pediatrics
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July 9/79

The University of Manitoba Rheumatic Disease Unit is co-operating with Miss Janine Chenier, who is planning on carrying out a research project on the vocal characteristics of patients with Rheumatoid Arthritis as part of her thesis for her course in Speech Therapy, which she is taking at the University of North Dakota in Grand Forks.

This study will involve a minimal amount of your time and will allow her to assess any changes that may have taken place in your voice as a result of Rheumatoid Arthritis affecting the joints in your throat.

You are probably aware that these joints are involved sometimes in patients with Rheumatoid Arthritis and you may have had personal problems with it.

This area has not been explored in the past and I think it would be a useful addition to understanding this disease and we may want to tie this study in with some additional examinations, in conjunction with the Department of Otolaryngology here at the University of Manitoba at a later date.

Miss Chenier will be telephoning you directly and will answer any other questions about the study.

/2

We would appreciate your co-operation but if you do not feel that you are able to participate in this study please do not hesitate to say so. This will in no way change our arrangements for supervising your arthritis here at the Rheumatic Disease Unit.

If you have any other specific questions about this proposal, please do not hesitate to contact me.

Yours sincerely,

F. D. BARAGAR, M.D., F.R.C.P. (C)
DIRECTOR
RHEUMATIC DISEASE UNIT

APPENDIX II

COVER LETTER

Dear

Thank you for agreeing to participate in the study I discussed with you over the telephone on _____.

Your appointment with Dr. Gorenstein and myself is scheduled for _____ at _____. You are asked to come to _____ for the voice assessment and throat examination. Enclosed is the questionnaire I told you about. Please complete it as thoroughly as you possibly can. If you have any problems answering certain questions, I will be happy to help you out when we meet. Be sure and bring the questionnaire with you at the time of assessment.

If you are suffering from a cold or sore throat due to an upper respiratory infection or laryngitis at the time you are scheduled for assessment, please contact me as early as possible at 247-7369 so that alternate arrangements can be made. If I am not at home you can leave your name and I will contact you.

I look forward to meeting you in the near future.

Yours truly,

Janine Chenier
Graduate Student

Dean C. Engel, Ph.D.
Professor and Chairman

/psn

Enc.

APPENDIX III

QUESTIONNAIRE

INTERVIEW SCHEDULE

IDENTIFYING DATA:

Name:
Sex:
Age:
Address:
Phone No.:

Physician/Arthritis:

Physician/Ear-Nose-Throat:

Occupation:

INFORMATION RELATED TO ARTHRITIS AND GENERAL HEALTH:

1. How long have you had rheumatoid arthritis? _____ years

2. How would you describe the course of your disease? (Circle one)

   mild moderate moderately severe severe

3. Do you presently suffer from morning stiffness?
   _____ yes _____ no

4. If yes, about how long does the stiffness usually last? ____ hours

5. Are you presently taking any of the following medications?

	Check If Yes	Name of Drug	Dosage	How Long Taken
anti-histamines	_____	_____	_____	_____
anti-depressants (tranquilizers, etc.)	_____	_____	_____	_____
birth control pills	_____	_____	_____	_____
sex hormones (e.g., progesterone, testosterone, etc.)	_____	_____	_____	_____
thyroid medications	_____	_____	_____	_____
anti-inflammatory drugs (e.g., prednisone, valisone, etc.)	_____	_____	_____	_____
aspirin	_____	_____	_____	_____
anti-arthritic drugs (e.g., butazolidine, indocin, zyloprim, etc.)	_____	_____	_____	_____
other	_____	_____	_____	_____

6. Which of these drugs have you taken in the past but are no longer taking?

Name of Drug	Dosage	How Long Taken	How Long Ago (when)

7. Are you diabetic? _____ yes _____ no. If yes, what medications, if any, do you take? (include under "other" #5)

8. Do you suffer from any chronic lung disease? _____ yes _____ no
Name: _____ Duration _____ years

9. Do you have any other diagnosed or suspected health problems related to your throat, mouth, or nose and sinuses which may affect your voice? _____ yes _____ no
Explain: _____

10. Have you ever been diagnosed as having a problem with your thyroid gland? _____ yes _____ no
If yes, are you hyperthyroid _____ or hypothyroid? _____

11. If you get depressed are you aware of any voice change while you are feeling down? _____ yes _____ no
Describe: _____

12. What medication, if any, do you take when you are depressed?
Name: _____ Dosage: _____

13. When was the last time you had your hearing tested? _____ years ago

14. Do you have a hearing loss? _____ yes _____ no

If you answered yes to #14, answer #15, #16, and #17.

15. How long has your hearing loss existed? _____ years _____ months

16. Do you wear a hearing aid? _____ yes _____ no. If yes, how long have you worn it? _____ years _____ months

17. Were you aware of any voice change or problem prior to your hearing loss? _____ yes _____ no

18. Do you suffer from any allergies that affect your breathing or throat? _____ yes _____ no

19. Do you think you suffer from colds and sore throats:
a) less often; b) as often; c) more often
than most people? (circle one)

GENERAL INFORMATION:

20. Do you experience dry lining of your mouth? _____ yes _____ no
or your nose? _____ yes _____ no If yes, when? _____

21. Do you smoke? _____ yes _____ no. If yes, how long have you
smoked? _____ years_____ months

If you answered yes to #21, answer #22 and #23.

22. How much do you smoke? (circle one)
a) less than 2 packs/week; b) ½ pack/day; c) 1 pack/day;
d) more than one pack/day

23. Is there any change in your voice when you've smoked more than
usual? _____ yes _____ no. If yes, describe: _____
_____

24. Do you drink alcoholic beverages? _____ yes _____ no

If you answered yes to #24, answer #25, #26, and #27.

25. Do you consider yourself to be a social drinker? _____ yes _____no

26. Do you consume alcoholic beverages on a daily basis?
_____ yes _____ no

27. Is there any change in your voice when you've had several ounces
of alcohol? _____ yes _____ no

28. How many times have you been given general anaesthetic since
you've had arthritis? _____

29. Have you had any problems breathing when you first woke up after
the surgery? _____ yes _____ no _____ not applicable

30. Have you noticed any voice change following anaesthetic?
_____ yes _____ no _____ not applicable

31. Do you sometimes feel like you're out of breath? _____ yes _____no

32. If yes, when: (check those that apply to you)
_____ while talking
_____ while walking or during other mild physical activities (i.e.,
climbing a few stairs)
_____ when sitting still
_____ when lying still

33. Do you sometimes notice your breathing is noisy in your throat?
_____ yes _____ no If yes, when? _____

INFORMATION RELATED TO USE OF YOUR VOICE

34. Does your occupation require that you do a lot of talking?
_____ yes _____ no If yes, explain: _____

35. Are you often required to raise your voice to be heard over noise such as office or shop machinery? _____ yes _____ no

36. Do you consider yourself to be: (circle one) less talkative; as talkative; more talkative as compared to other people you know?

37. Do you usually project your voice and speak at a louder level than most people you know? _____ yes _____ no

38. Are you aware of any habits you might have such as yelling, that may put strain on your voice? _____ yes _____ no
If yes, explain: _____

THE FOLLOWING QUESTIONS REFER TO SYMPTOMS NOT ASSOCIATED WITH TEMPORARY INFECTIONS, COLDS, OR LARYNGITIS:

39. Do you do a lot of coughing _____ yes _____ no, or throat clearing? _____ yes _____ no If yes, when? _____

40. Do you ever feel pain in the area of your throat? _____ yes
_____ no

41. Does this pain sometimes travel up to one or both ears? _____ yes
_____ no _____ not applicable

42. Do you ever have a sensation of fullness or tension in your throat?
_____ yes _____ no

43. Do you ever have painful/difficult swallowing? _____ yes
_____ no

44. Does your voice sometimes sound different to you? _____ yes
_____ no

IF YES TO #44 -- ANSWER THE FOLLOWING SECTION:

45. Does your voice sound different to you only when you feel pain in your throat? _____ yes _____ no

46. Have you ever lost your voice completely? _____ yes _____ no

47. If yes, how frequently? _____ times per year (average)
For what lengths of time? _____

48. Can you recall when you first became aware of this change in your voice? (check one)
_____ Before arthritis was diagnosed
_____ After arthritis was diagnosed

49. Does the pain in your throat occur: (circle one)
a) with an arthritic flare-up
b) without an arthritic flare-up
c) both a and b

50. Do you notice the change in your voice when you: (circle one)
a) are having an arthritic flare-up
b) aren't having any unusually acute joint pain
c) both a and b

51. Does dry winter weather seem to affect your voice? _____ yes
_____ no If yes, how? _____

52. Does excessive talking increase the problem or change in your voice? _____ yes _____ no

53. At what times of day is your voice best? (circle one)
a) upon arising before I do much talking
b) after I've been up and talking throughout a normal day
c) I have not noted any systematic pattern

54. At what time of day is your voice worst? (circle one)
a) upon arising before I do much talking
b) after I've been up and talking throughout a normal day
c) I have not noted any systematic pattern

55. Was there anything particularly different about your voice before you became ill with arthritis? _____ yes _____ no
If yes, explain: _____

56. Have you ever received medical treatment because of a voice problem? _____ yes _____ no If yes, what was the diagnosis:
_____

57. Have you ever received medical treatment because of pain in your throat <u>not</u> due to a cold or sore throat? _____ yes _____ no
If yes, explain? _____

58. Did you ever sing in a school or church choir, or as a soloist?
_____ yes _____ no

59. If yes, is there a change in your voice which prevents you from singing now? _____ yes _____ no

60. If you sang for your own pleasure, do you sound the same now as you once did? _____ yes _____ no _____ not applicable

61. If your voice has changed when you sing, how has it changed? (circle all appropriate items) a) lowered pitch; b) loss of range; c) unstable pitch; d) poor intensity or loss of volume: 3) other (describe) _____

THE FOLLOWING SECTION IS TO BE ANSWERED BY FEMALES ONLY:

62. If you notice fluid retention just prior to your menstrual period, are you ever aware of your voice changing (become deeper, lower in pitch) at this same time? _____ yes _____ no _____ not applicable

63. Have you had a hysterectomy? _____ yes _____ no

64. Have you undergone menopause _____ yes _____ no or are you presently undergoing menopause? _____ yes _____ no

65. Are you taking any medication related to your menstrual condition? _____ yes _____ no (If yes, include under #5).

66. Have you ever taken medication related to your menstrual condition in the past that you are no longer taking now? _____ yes _____ no (Include in #6)

67. Are you pregnant? _____ yes _____ no If yes, estimate due date: _____

68. Have you noticed any voice changes during past pregnancies? _____ yes _____ no _____ not applicable

I WILL BE ASKING YOU TO ANSWER THE FOLLOWING QUESTIONS ONLY WHEN YOU ARE SEEN FOR THE VOICE ASSESSMENT:

1. Is your vocal quality today the way you normally sound?

2. Are you feeling more tense than usual talking to me today?

3. Are you feeling depressed today?

WOMEN ONLY:

4. Are you due to start menstruating in the next 2-3 days?

5. Are you presently menstruating?

QUESTIONS TO BE COMPLETED WITH THE EXAMINER AT THE TIME OF ASSESSMENT

1. Is your vocal quality today the way you normally sound? _____ yes
   _____ no If no, explain: _____

2. Are you feeling more tense than usual talking to me today?
   _____ yes _____ no

3. Are you feeling depressed today? _____ yes _____ no

WOMEN ONLY:

4. Are you due to start menstruating in the next 2-3 days?
   _____ yes _____ no _____ not applicable

5. Are you presently menstruating? _____ yes _____ no
   _____ not applicable

APPENDIX IV

LETTER OF EXPLANATION TO SUBJECTS

Purpose of This Research Project:

Thank you for taking part in this research project. With the completion of the questionnaire, voice sampling and physical examination of your vocal cords and throat you have finished your contribution to this study.

The answers to your questionnaire will be analyzed. Your voice sample will be described by three trained judges as to what characteristics may be most predominant, i.e., breathiness, tension, hoarseness, etc. The data from this study will be run through a computer in order to determine if there is any significant relationship (1) between arthritics with voice problems who smoke as compared to those who don't smoke or (2) to the various medications taken or (3) to the determination of arthritic involvement of the larynx, etc.

When this project is completed, probably in the spring or early summer, I will send you a letter describing the results and conclusions learned from this study. This way you will see how your participation contributed to the whole project and how the results might be used to encourage further research in order to find treatment for the disorder.

Thank you so much for letting me work with you. Your willingness to participate in this project is greatly appreciated.

Sincerely yours,

Janine Chenier
Graduate Student

Dean C. Engel, Ph.D.
Professor and Chairman

/psn

APPENDIX V

VOICE PROFILE FORM

VOICE PROFILE

NAME: _____ AGE: _____ SEX: _____

[circle one]
VOICE RATING: 1 2 3 4 5 6 7

LARYNGEAL CAVITY
PITCH
high
B
+3
+2

A open -4-3-2 1 +2+3 closed
-2
-3
low

RESONATING CAVITY
NASALTY
hypernasal
C
+4
+3
+2

-2 1 +2
-2
hyponasal

-2
soft

-2
monotone

INTENSITY
1 +2
loud

VOCAL RANGE
1 +2
variable
pitch

Indicate presence or absence of acoustic feature by [ ]

	YES	NO
INTERMITTENT DIPLOPHONIA	___	___
DIPLOPHONIA	___	___
AUDIBLE INHALATION	___	___
PITCH BREAKS	___	___
ERRATIC PHRASING	___	___
IMMATURE RESONANCE	___	___

MARKING SYSTEM

Primary Feature X
Intermittent Feature [int]
Secondary Feature /
Noted Feature /

APPENDIX VI

FOLLOW-UP LETTER OF ENQUIRY

Dear

In early March you kindly participated in the voice study I was carrying out at the Health Sciences Centre. You indicated on the questionnaire that you thought your talking voice was, on occasion(s), different than your regular voice. I am interested in hearing how you would describe the change so that I can report your opinion in my research.

I would appreciate it very much if you could complete the following portion of this form and return it to me in the stamped, self-addressed envelope I've enclosed. Please check off the following items which apply to how your speaking voice sounds when it is different than your usual voice:

1) the loudness is reduced, it sounds weak
2) it sounds lower than usual
3) it sounds higher than usual
4) it sounds whispery
5) it cracks while I'm talking
6) it sounds strained
7) speaking too long tires and weakens my voice
8) it sounds hoarse
9) other

Please make any additional comments describing your voice change:

_____

_____

I thank you again for all the cooperation you have shown me during this study.

Sincerely yours,

Janine Chenier
Graduate Student

/psn

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