VOCAL SYMPTOMS AND CHARACTERISTICS OF

IMAMS

H. MOHAMED YASIN

Register Number: 16SLP013

This Dissertation is submitted as part fulfillment

for the Degree of Master of Science in Speech Language Pathology

University of Mysore, Mysuru

ALL INDIA INSTITUTE OF SPEECH AND HEARING

MANASAGANGOTHRI, MYSURU-570006

April 2018

CERTIFICATE

This is to certify that this dissertation entitled "**VOCAL SYMPTOMS AND CHARACTERISTICS OF IMAMS**"bonafide work submitted in part fulfillment for the degree of Master of science (Speech Language Pathology) of the student (Registration No: 16SLP013). This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other university for the award or any other diploma or degree.

Dr. S R. Savithri
Director
All India Institute of Speech and Hearing,
Manasagangothri, Mysore -570006

Mysore
April, 2018

CERTIFICATE

This is to certify that the dissertation entitled "**VOCAL SYMPTOMS AND CHARACTERISTICS OF IMAMS**" has been prepared under my supervision and guidance. It is also certified that this has not been submitted earlier in any other University for the award of any Diploma or Degree

<div align="right">

Dr. T. Jayakumar
(Guide)
Reader in Speech Sciences
All India Institute of Speech and Hearing
Manasagangothri, Mysuru-570006
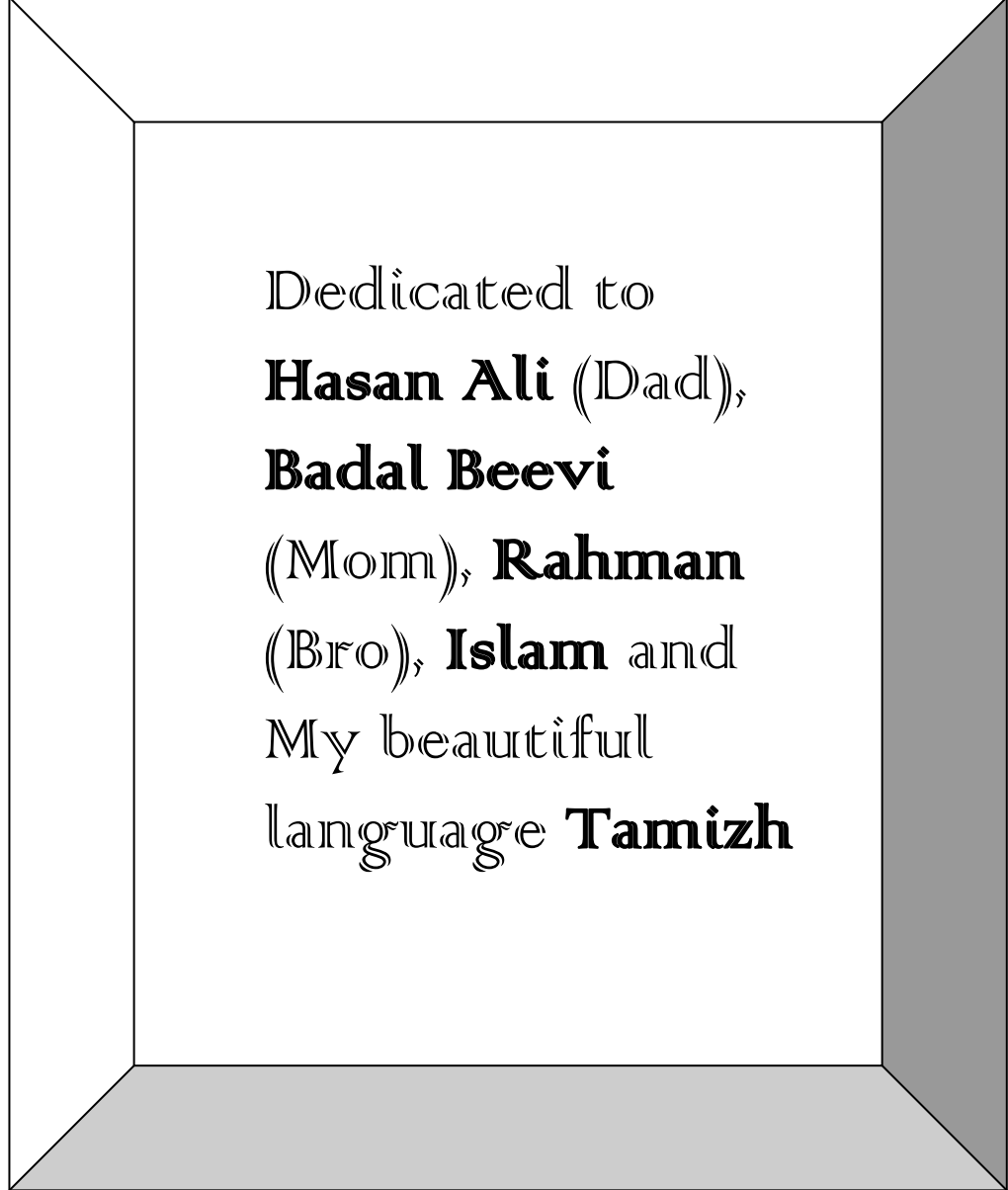
</div>

Mysuru,
April, 2018

DECLARATION

This is to certify that this dissertation entitled "**VOCAL SYMPTOMS AND CHARACTERISTICS OF IMAMS**" is the result of my own study under the guidance of Dr. T. Jayakumar, Reader in Speech Sciences, Department of Speech and Language Sciences, All India Institute of Speech and Hearing, Mysuru, and has not been submitted earlier in any other University for the award of any Diploma or Degree.

<div align="right">

Register No: **16SLP013**
All India Institute of Speech and Hearing
Manasagangothri , Mysuru-570006

</div>

Mysuru,
April 2018

இயாமறிந்த மொழிகளிலே தமிழ்

மொழிபோல் இனிதாவது எங்கும் காணோம்

- மகாகவி பாரதியார்

Dedicated to
Hasan Ali (Dad),
Badal Beevi
(Mom), **Rahman**
(Bro), **Islam** and
My beautiful
language **Tamizh**

Acknowledgments

*I would like to express my sincere gratitude to all of them who made this piece of work possible. First of all, I am extremely grateful to my dissertation guide, **Dr. T. Jayakumar**, Reader in Speech sciences, All India institute of speech and hearing, Mysuru for his valuable guidance, scholarly inputs and constant encouragement I received throughout my research work. This work was possible only because of the unconditional support provided by him. Thank you, Sir, for all your help and support.*

*I thank **Dr. S. R. Savithri**, Director AIISH, Mysuru for permitting me to do my study. I thank HOD, Dept. of speech language sciences for providing academic support and facilities provided to carry out the research work at the institute.*

*I thank all who helped me through this work process: **Asarudeeen, Abbas, Sohail, Imams** and others participated in the study, for helping me in data collection. **Rasidha, Asar and Imran** for beautifully translating the questionnaire in Tamil. **Dr. Gopi Shankar, My Guide Dr. T. Jayakumar and Dr. Rajasudhakar** for validating the questionnaire. **Udhay Kumar, Asar, Ritwik, Nishanth Rohit and Amit** for technically supporting me. **Yeshwanth, Mithul and Swalih** for data analysis and **Anooop and Udhay** for helping in formatting this dissertation.*

*I would like to thank **Sree Devi mam, Yeshodha mam, Y. V. Geetha mam, Savithri mam, Prema mam, Rajasudhakar sir, Santosh sir, Brijesh sir, Pushpavathi mam and Shyamala mam** for being wonderful teachers.*

TABLE OF CONTENTS

Chapter No.	Contents	Page no.

LIST OF TABLES

LISTS OF FIGURES

Chapter 1

INTRODUCTION

Voice is a powerful tool that influences many aspects of human interaction and culture. Voice is the sound produced by the vibration of vocal folds. The air coming out of the respiratory system is impeded by the vocal fold and the subglottal pressure is created. When the vocal folds vibrate the air from the sub glottis rushes out and create the vibration in the air column above the vocal cords and thus producing voice (Van Riper, 1939). Voice is our primary means of communication. Communication by voice begins at birth. The birth cry is the first sign of our survival. The cry then becomes the communication between the child and the mother. The child slowly develops the cry into vocables, then to meaningful utterances and beautiful songs.

Voice is not only the source of communication but also an identity of an individual. It tells who we are and forms the uniqueness in our personality. Voice quality also plays a crucial role in the communication of our emotions, attitude and mood. According to Gobl and Chasaide (2002) there is a very clear association of anger with tense voice, and creaky voice with boredom, or breathy voice with sadness or intimacy. Voice is also sometimes a health indicator. The child's birth cry is a very good indicator of the health condition even in adults the voice indicates the physical health condition. Hence voice is a survival factor for

majority of the human being but for few of us apart from the survival factor, it is their profession aspect and such people are called professional voice users.

Professional voice users are the people who use their voice for occupational competence, and vocal communication for their livelihood. This includes teachers, salesmen, singers, drama artist, clergy, politicians, broadcasters, orators and numerous other professionals.This group of people has greater risk for developing voice problems if good vocal habits are not followed. Not only can the vocal symptoms but there be overlay of emotional strain and anxiety also be faced by them. The severity of the problem depends on the nature of the profession, ability to meet the professional demands and commitments. Kaufman (1991) classified professional voice users into four categories.

(or)

- **The Elite Vocal Performer, Level I**, is a person for whom even a slight aberration of voice may have dire consequences. Most singers and actors are in this group; the opera singer is the quintessential level I performer.

- **The Professional Voice User, Level II**, is a person for whom a moderate vocal problem might prevent adequate job performance. This group includes most clergy, teachers, lecturers, receptionists, etc.

- **The Non-Vocal Professional, Level III**, is a person for whom a severe vocal problem would prevent adequate job performance. This group includes lawyers, physicians, businessmen, business women, etc.

- **The Non-Vocal Non-Professional, Level IV**, is a person for whom vocal quality is not a prerequisite for adequate job performance. This group includes clerks, laborers, and so forth. Although persons in this group may suffer very significant social liability from a voice disorder, they are not prevented from doing their work.This classification professional voice users at different level helps us to identify whose performance in occupation is affected to what extent due to voice disorders.

Unlike elite professional voice users non elite profession voice users don't have formal training or knowledge on the voice usage. The problems are always identified in the later stages of the voice disorder and thus affecting the outcome of the management. Thus the prevalence of voice disorders are more prevalent in non-elite voice users than the elite voice users.

Many studies have been done to study the prevalence of voice disorders in professional voice users. Rechenberg et al (2011) reported Vocal symptoms are common in most telemarketers when compared to their peer controls, and significantly affect their job performance and these symptoms interfere with their professional activity for almost 70% of the group.

Teachers are the widely studied population in non-elite professional voice users. The prevalence of voice disorders during their lifetime was 57.7% for teachers (Roy et al, 2004)and prevalence is high in female teachers than male (Angelillo et al, 2009)

Russell et al (1998) investigated the prevalence of self-reported voice problems in on 1168 state school teachers (preschool-Grade 12) in South

Australia. 16% of teachers reported voice problems on the day of the survey, 20% reported problems during the current teaching year, and 19% reported problems at some time during their career. Females were twice as likely as males to report voice problems. Devadas, Bellur and Maruthy (2017) reported prevalence of voice problem among primary school teachers. And prevalence rate was17.4%. the vocal symptoms reported are vocal fatigue, sore throat, voice strain, muscle tension in the neck region and difficulty in projecting voice.

There are several contributors to poor vocal health causing voice problem such as intake of non-prescriptive drugs, cigarette smoking, marijuana use, chewing tobacco, frequent coughing and throat clearing, alcoholin taking, caffeine intake, sleep deprivation, vocal load, vocal fatigue, talking too loudly, poor nutrition, obesity, dehydration, allergies, acute sinusitis etc., the misuse or abuse of the voice will cause organic pathology of the larynx that affects the quality of voice. The vocal cords vibrate too much or at higher rate causing collisions of one vocal cord against each other. This improper usage or misuse can lead to the development of lesions on the vocal cords that affect the normal vibration pattern of the vocal cord and the voice may sound breathy, hoarse or harsh.

Individual who involve in prolonged periods of voice use or vocal loading are at higher risk of voice disorders such as Vocal nodules, vocal cord polyp (blister), vocal cord cyst, Varices, ecstasies, Vocal cord sulcus etc., and symptoms of vocal fatigue such as period of complete voice loss, decline in voice quality soreness of throat and dysphonia. Vocal loading refers to the demands posed by voice use needs on the laryngeal system. During the initial period of

vocal loading the vocal system is said to be in the warm up state later the vocal loading leads to vocal fatigue. Vocal fatigue is the decline in voice quality observed over a long period voice usage. A fatigued voice may sound hoarse perceptually, voice production may appear more effortful and this may eventually lead to complete loss of voice. The prolonged voice usage can be due to their occupational demands and voice over usage in professional voice users is common. Effect of voice over usage had been in studied extensively on professional voice users such as singers, teachers, clergies, salesmen etc. Boominathan et al (2008) reported the most common symptoms in professional voice users as change in voice quality, voice fatigue, discomfort in throat, hoarseness, loss of voice, loss of intelligibility/clarity of speech/song,drythroat, shortness of breath, frequent throat clearing, itchy throat, voice tightness, loss of voice control and inability to maintain shruthi/range. The effects of voice problems can be quite serious in professional voice users. These effects may be less pronounced in the cases of other voice professional.

Priests are one of the non-elite professional voice user populations who are constantly subjected to vocal load. This group represents a unique group of voice users who perform at a professional level. In addition to this cultural norms create great diversity in terms of style of delivery and typical venues, adding to the huge variables in this subset of professional voice users. Hapner and Gilman (2011) studied the vocal load in Jewish cantors using 35 items multiple choice questionnaire. Items were related to vocal demands, medical history and voice training. Results indicated that the commonly associated risk factors for

developing voice disorders such as high vocal demands, reduced vocal downtime, allergies, and acid reflux were present in this population. More than 65% of the subjects reported having voice problem that interfered with their ability to perform their duties at some time during their careers.

Hagelberg and Simberg (2015) studied the prevalence of voice problems in priests. 2044 evangelical Lutheran priests were subjected to an electronic questionnaire. The results showed that the prevalence of voice problems in priests was high. Of the participants, 24.5% had sought help for voice problems and 18% reported that they had been diagnosed with a voice disorder by a physician. Twenty-one percent considered themselves as having current voice problems, and 26.7% reported frequently occurring vocal symptoms. Voice-related absenteeism was reported by 11.6%. Significantly, more females than males reported voice problems.

Devdas et al (2016) studied prevalence and influencing risk factors of voice problems in Mar Thoma priests in Kerala. 270 Mar Thoma priests with 1–35 years of professional experience were selected randomly for the study and a self-reported questionnaire was used to collect the data. Mar Thoma priests were found to have higher career (47.8%) and year prevalence (25.2%) of voice problems with 17.8% of them reporting frequent voice problems during their career. Asthma, allergy and frequent throat clearing behavior were found to have significant association with priests reporting frequent voice problems. Significantly higher number of priests with frequent voice problems missed their work.

These studies shows valuable preliminary information on the prevalence voice problems and high risk factors in priests and also that this population is one of the target populations whose vocal symptoms and characteristics have to be studied in detail. Priest from different religion and cultural background are unique in the form of service delivery and thus creating differences in their vocal demand.

Voice disorders may lead to loss or fear of loss of career, Frustration and emotional set back, economical burden, reduced professional competence etc, one of such professional voice users in Muslim community is Imam .Imams are the Muslim priests who lead the daily Congregational prayers at the mosque. The minimum qualification for the Imam post is the Bachelor degree in Alim. The Alim course is a comprehensive study of the Islamic Sciences, the breadth of which includes expertise in Arabic, Literature, Al-Qur'an, Hadith, Islamic Law and Islamic History. Courses are offered in a traditional environment with students spending approximately six hours per day receiving direct instruction and practices from certified scholars. The coursework prepares students to become Imams, school teachers, administrators of Islamic Institutions, academic researchers and writers.

They are professional voice users falling under the level II category in the classification of professional voice users.They also delivery speeches during weekly Friday and two annual congregational prayers, teach children at Madhrasa, involve in public lectures and educational programs. In addition to this during the month of Ramadan (month of fasting) they lead night prayers for about

1.5hours at a stretch every night. The imam also leads all other special prayers, such as for funerals, prayers for rain, and prayers during an eclipse, and more. The daily congregational prayers will be conducted by the Imam five times a day. Each prayers will be held minimum of 5 minutes followed by period of supplication of about 3 minutes. During the congregational prayer and supplication the Imam has to recite the Quranic verses with more vocal effort to project it clear and melodic to the people following him in the prayer and between prayers there will be 2 – 5 hours interval where imam is free to do his daily needs if there are no other special rituals. Imams teach children at Madharasa daily for about 1.5 to 2 hours and every child is taught individually unlike teachers do at school.

Farahat and Mesallam (2016) studied the prevalence and psychosocial aspect of voice problems in Saudi imams by administrating Arab Voice Handicap index-10 (AVH-10) and a questionnaire developed by Boltezar (2009). The study included 93 Imams and 82 control subjects. A-VHI-10 scores were compared between both Imams and the control group. Also, A-VHI scores of Imams were compared considering different variables included in the general questionnaire. The items in the questionnaire were classified under five main categories, they are

  (1) Demographic data and living habits including social status data, age, sex, marital status, and number of offspring

  (2) Work experience characteristics that affect voice demand including years of experience and whether the subject had teaching assignments

(3) Impact of voice problems on their career including frequent absenteeism from praying (attend but not leading prayers), thinking of leaving the Imam's career

(4) Voice-related symptoms including change in voice, choking, and voice fatigue

(5) Impact of awareness of voice hygienic instructions on their career.

The result revealed that Sixty Imam (65%) participated in this study reported a change in their habitual voice. On comparing the VHI-10 results between Imams and control subjects, there was significant difference demonstrated between the 2 groups regarding the total VHI score as well as the three domains (functional, physical, and emotional).

There was no significant difference when comparing VHI scores of different age groups of Imams included in this study. This result matches the findings of other related studies that investigated risk factors and effects of voice problems among teachers. Also, there was no significant difference between voice problems in Imams considering either marital status or number of offspring. Although years of experience were found as an important contributing factor to vocal dysfunction in teachers, this study showed no significance difference between the different groups of Imams when VHI scores were compared considering years of professional experience. This is because all of Imams, either in the prayers time or during Khutbah, are using microphones during the sermon, so the cumulative effect of prolonged voice use has no major role on their voice.

Abdelhamid and Khoufi (2016) studied the voice of imams before and after Ramadan (month of fasting). One group of imams was advised to follow vocal hygiene program and was not recommended for the other group. The results of MDVP and VHI revealed better results for the group advised to follow vocal hygiene program than the other group.

Need for the study

The vocal characteristics of professional voice users have been studied extensively using questionnaires, perceptual analysis and acoustic analysis. Among the professional voice users singers and teachers are widely explored. Few studies have been reported that includes clergies, and studies are mostly based on questionnaires. Looking through the literature, it is noticed that Imams are the group of population where no much studies were done to understand their vocal symptoms and voice characteristics.

Understanding the vocal symptoms of Imams is very necessary to bring appropriate preventive and remedial measures for the voice problem they face. Thus the current study aims to study the vocal symptoms of Imam.

Aim of the study

The aim of the current study is to understand the vocal symptoms and voice characteristics of Imams through acoustic analysis and questionnaire.

Objectives

1. To compare the outcome ofquestionnaire for studying the prevalence and risk factors for voice problems between both groups.

2. To compare the following parameters between group 1 (Imams) and Group 2 (control)

   a. Average Fundamental frequency (Mean Fo)

   b. Standard deviation of Fo (SDFo)

   c. FoTemor frequency (Fftr)

   d. Amplitude Tremor Frequency (Fatr)

   e. Jitter percentage (Jitter)

   f. Relative Average Pertuberation (RAP)

   g. Fundamental Frequency Variation (vFo)

   h. Shimmer percentage (Shimmer)

   i. Amplitude Pertuberation Quotient (APQ)

   j. Noise to Harmonic Ratio (NHR)

   k. Voice Turbulence Index (VTI)

   l. Fo – Tremor Intensity Index (Ftri)

   m. Amplitude Tremor Intensity Index (Atri)

Chapter 2

METHOD

2.1 Research method: The present study used standard group comparison research method.

2.2 Participants:

Total of 60 participants participated in the study with age range of 20 – 55 years. Participants were divided into two groups. Group I included 30 Imams with mean age of 36.8 years and group II included 30 normal individuals with mean age of 33.6 years. Group II was age and gender matched to Group I and all the participants were male in gender.The participants were recruited from Nagapattinam region, Tamilnadu.

2.2.1 Inclusion criteria for Group I

- Minimum of 5years' experienceas Imam.

- No history of hearing problems, language disorders, psychological, neurological, and cognitive problems.

- Fluent speaker of Tamil language.

- At the time of recording, no signs and symptoms of upper respiratory tract infection.

2.2.2 Inclusion criteria for Group II

- No history of hearing problems, speech and language disorders, psychological, neurological, and cognitive problems.

- Fluent speaker of Tamil language.

- At the time of recording, no signs and symptoms of upper respiratory tract infection.

- Nonprofessional voice users.

Based on the age, the imam group is classified into subgroups two groups, first subgroup covers the age range between 20 – 34 years and second subgroup covers 35 – 55 years. In terms of working experience the imam group is classed into two subgroups, first subgroup covers working experience of less than 20 years and second subgroup covers more than 20 years of working experience. Again based on voice usage in terms of hours per day the imam group is again divided into two subgroups, first subgroup covers voice usage of 1 to 2 hours per day and second subgroup covers voice use of period greater than 2 hours per day.

2.3 Voice survey questionnaire

A published self-reported (Voice survey) questionnaire in English language developed by Hocevar-Boltezar (2009) was used for the present study. The questionnaire was translated to Tamil language and translation validation was done by three Speech Language Pathologist (SLP) who has experience of more than 10 years in the field of voice pathology. The questionnaire contains binary choice questions and few descriptive answers questions.It consist of 22 questions that includes age, the vocal and non-vocal habits, information on career and presence of any medical condition causing voice disorders(asthma, allergy etc.,). The questionnaire was attached in Appendix. The voice questionnaire was administered only on Imam Participants (Group I). Although it was self-reported questionnaire, clarification on question were given to Imams on their request.

2.4 Instrumentation

Olympus (LS-100) was used to record the phonation sample of Imams and Normal participants. Multi-dimensional voice profile (MDVP) module from computerized speech lab (CSL-4500, Kay elemetrics) was used to analyze the phonation sample of Imams and normal participants. The selected parameters of MDVP used in this study for the comparison of voice characteristics between the two groups are

a. Average Fundamental frequency (Mean F0) – Average value of all extracted period to period fundamental frequency values.

b. Standard deviation of F0 (SDF0) – Variation of F0 within the analyzed voice sample.

c. F0 Tremor frequency (Fftr) – It is the frequency of the lowest frequency modulation component.

d. Amplitude Tremor Frequency (Fatr)–Frequency tremor amplitude index average ratio of the frequency

e. Jitter percentage (Jitter) – Relative evaluation of period t period (very short term) variabilityof the pitch within the analyzed speech sample.

f. Relative Average Perturbation (RAP) – Relative evaluation of period t period (very short term) variability of the pitch within the analyzed speech sample with smoothening factor of 3 periods.

g. Fundamental Frequency Variation (vF0) – Variation of the fundamental frequency

h. Shimmer percentage (Shimmer) – Relative evaluation of the period to period variation of the peak to peak amplitude within the analyzed voice sample.

i. Amplitude Perturbation Quotient (APQ) - Relative evaluation of the period to period variation of the peak to peak amplitude within the analyzed voice sample with smoothening factor of 11 periods.

j. Noise to Harmonic Ratio (NHR) - Average ratio of harmonic energy in range of 1500 Hz - 4500 Hz to harmonic energy in the range of 70 - 4500 Hz.

k. Voice Turbulence Index (VTI)- A ratio of the spectral in-hormonic high frequency energy inrange1800-5800 Hz to the spectral harmonic energy in the range of 70 - 4500 Hz.

l. F0 – Tremor Intensity Index (Ftri) – Average ratio of frequency magnitude of the lowest frequency modulation to total frequency modulation.

m. Amplitude Tremor Intensity Index (Atri) – Average ratio of the amplitude of the most intense low amplitude modulating component for the total amplitude of the analyzed voice sample.

2.5 Procedure

Imams were made to sit in a quiet room and in comfortable position. They were asked to fill the questionnaire and seek for clarification if require. Once they complete the questionnaire, they were asked to phonate vowel /a/ as long as possible at comfortable pitch and loudness. The phonation samples were recorded

using Olympus (LS-100) voice recorder. A similar procedure was followed for normal participants but only phonation sample was recorded.

2.6 Statistical Analysis

The obtained parameters were tabulated and subjected to statistical analysis in Statistical Package for the Social Sciences (SPSS) software package (Version 21.0). Voice questionnaire was analyzed for frequency count and percentage for each question.Chi-Square test is done to check differences among the Imam groups classified based on age, work experience and voice usage for the questionnaire data. Descriptive statistics was carried out to calculate mean, median and standard deviation for both the groups. Man-Whitney U test was done for across group comparison.

Chapter 3

RESULTS

The present study aimed at investigating the vocal characteristics of Imams through voice survey questionnaire and acoustic analysis. The study included two groups (Group I – imams & Group II –Normal). Sampling of Phonation for both the groups and voice survey was done to group I. Acoustic analysis was done using MDVP module of CSL and the data of both acoustic analysis and the voice questionnaire survey were fed into SPSS software for statistical analysis.

The following statistical analyses were done:

1. Outcome / frequency counts of voice questionnaire data

2. Comparison of subgroups of Imams based on questionnaire

3. Normality check of acoustic data

4. Descriptive statistics of acoustic parameters for Imam and normal groups.

5. Comparison of Imams and Normal for acoustic parameters

6. Comparison of subgroups of Imams for acoustic parameters

Saphiro - wilks test was done to check the normality and the result showed non- normal distribution for both the groups.

3.1 Outcome/frequency counts of voice questionnaire data

Voice survey questionnaire was administered only on imam group. Frequency count was calculated as answers of the questionnaire. The frequency

count and the percentage is displayed in the table 3.1.The questionnaire also included demographic data such as name, Age, the positionat work.

All the participants of Group-I (Imam) involved in teaching religious lessons to children attending Madhrasa, and all participants experienced voice problem in their career.

Most of the Imams had poor vocal and non-vocal habits such as shouting, speaking loudly and speaking fast, throat clearing and consuming more than 2 cupsofcoffee per day.

Some positive vocal habits such as consuming more than 1 litre of water per day (90%) and giving proper voice rest after continuous speech such as addressing crowd at mosque on Fridays and devoid of smoking (100%) were reported.

About 63% of the participants from imam group were suffering from asthma, allergic rhinitis or any other allergic diseases but most of them and 90% of them had acid regurgitation and pyrosis (heart burn), and also had habit of going to bed soon after the dinner.

Imams during their course period were not trained orexposed to any vocal techniques as reported butthey were trained in Arabic Thajweed (Mastering pronunciation).

Table 3.1: Frequency counts and percentage of voice questionnaire data

Q.No.	Questions	Response	Frequency (out of 30)	(%)
4	Do you teach religious lessons?	Yes	30	100
6	Did you have voice problems last year?	Yes	29	96
7	Did you have voice problem any time in your career?	Yes	30	100
8	Did you have voice problems before starting with your profession?	No	30	100
9	During your studies, did you have lessons on vocal technique?	No	30	100
10	Does it happen to you that you cannot work and have to stay at home because of voice problems?	No	27	90
12	When having voice problems do you have a voice rest and not talk?	Yes	30	100
13	Do you speak loudly?	Yes	30	100
14	Do you shout often?	Yes	29	96
15	Do you speak fast?	Yes	21	70
16	Do you often clear your throat?	Yes	30	100
17	Do you have an extra vocal load in your spare time?	No	28	93
18	Do you smoke?	No	30	100
19	Do you drink more than 2 cups of coffee per day?	Yes	30	100
20	Do you drink at least one liter of liquid (e.g. water) per day?	Yes	27	90
21	Do you have problems with your stomach, do you feel acid regurgitation and pyrosis (heart burn), do you eat before going to bed?	Yes	27	90
22	Do you have asthma, allergic rhinitis or any other allergic diseases?	Yes	11	63

Answers for Question 1,2,3,5 and 11 are descriptive and the responses are explained above.

The participants in the Imam group were divided into subgroups based on Age, work experience and voice usage and the data were subjected to Chi square test. No significance differences were observed between the groups under each category (P>0.05) and results are displayed in Table 3.2

Table 3.2: χ2 value and p-value for comparison of subgroups of Imam

Q. NO.	Age		work experience		voice usage	
	χ2 value	P value	χ2 value	P value	χ2 value	P value
4	-	-	-		-	
6	0.517[a]	0.472	1.353[a]	0.245	0.690[a]	0.406
7	-	-	-	-	-	-
8	-	-	-	-	-	-
9	-	-	-	-	-	-
10	1.667[a]	0.197	0.739[a]	0.392	0.988[a]	0.326
12	-	-	-	-	-	-
13	-	-	-	-	-	-
14	0.517[a]	0.472	1.353[a]	0.245	0.690[a]	0.406
15	2.857[a]	0.091	0.524[a]	0.469	4.471[a]	0.034
16	-	-	-	-	-	-
17	0.268[a]	0.605	0.039[a]	0.844	0.089[a]	0.765
18	-	-	-	-	-	-
19	-	-	-	-	-	-
20	1.667[a]	0.197	0.136[a]	0.713	0.062[a]	0.804
21	0.000[a]	1	2.549[a]	0.110	2.222[a]	0.136
22	0.287[a]	0.592	.344[a]	0.558	.096	0.757

3.2 Comparison of acoustic parameters across the groups

Acoustic analysis of phonation sample was done for both the groups and the raw data were fed into SPSS software version 21.0 and Saphiro-wilk test was done to check the normality and the data were found to be non- normally distributed in majority. Descriptive statistics were done to calculate Mean, standard deviation, and Median for both groups and the values are displayed in the Table 4.3. The Mean value of all the acoustic parameters is higher for Imams group than the Normal group. Specifically, Mean and Median of SDF0, vF0, Shimmer and APQ were much higher than the other parameters. Standard deviation was higher for all parameters in the imam group except for F0 and Fatr. The Mean and Standard deviation are represented in the Figure 3.3

Table 3.3: Mean, Standard deviation and Median of Imam and Normal Groups

Parameters	Imam			Normal		
	Mean	Standard deviation	median	Mean	Standard deviation	Median
F0	128.9	15.63	123.4	130.0	19.89	130.3
sdF0	4.085	4.080	2.720	1.790	1.403	1.286
Fftr	4.475	2.763	4.125	3.840	2.056	3.228
Fatr	3.904	1.946	3.250	3.444	2.415	3.032
Jitter	1.326	0.786	1.106	0.744	0.619	0.467
RAP	0.770	0.490	0.650	0.492	0.385	0.322
vF0	3.056	2.922	2.005	1.599	1.157	1.008
Shimmer	5.855	3.262	4.997	3.653	1.053	3.293

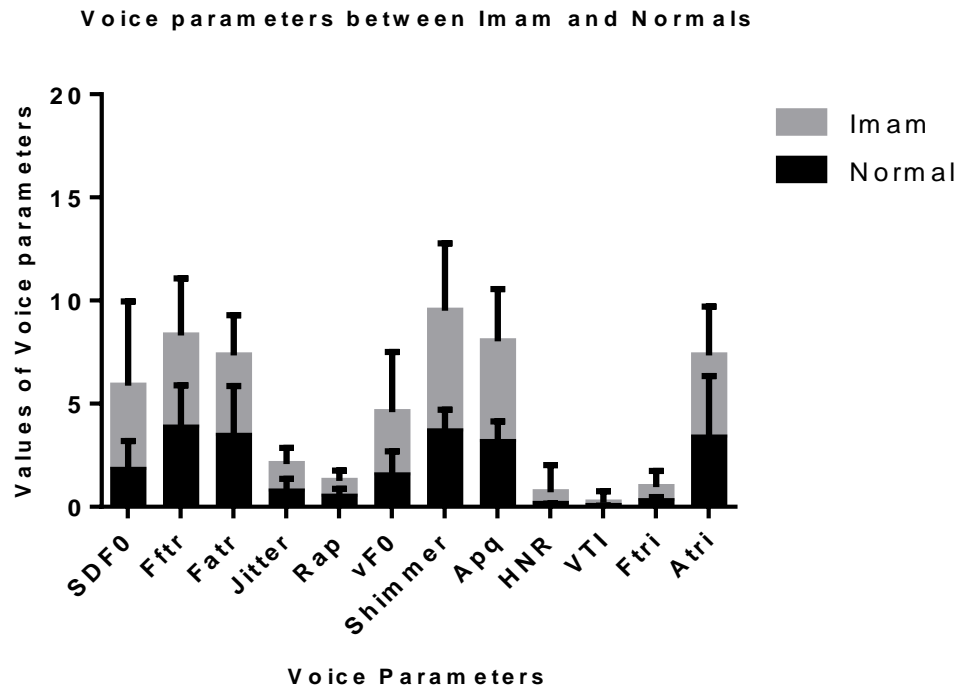|						
APQ	4.876	2.532	4.762	3.144	0.991	0.991
NHR	0.573	1.308	0.159	0.138	0.026	0.026
VTI	0.169	0.546	0.052	0.037	0.129	0.012
Ftri	0.689	0.773	0.397	0.273	0.203	0.203
Atri	3.970	2.380	3.798	3.363	2.972	2.972

Figure 3.1: Bar graph for voice parameters between Imams and Normals

Inferential statistics (Man-Whitney U test) was done for comparison of acoustic parameters across groups. The obtained Mean values were then subjected to Man-Whitney U test and |Z| values were obtained. The Mean, Standard deviation and |Z| for Imam and normal groups were indicated in the Table 3.4

Table 3.4:Z value and P value of comparison of Imam and Normal group.

| Parameters	M(SD) of Imam	M(SD) of Normal	Z value	P value
F0	128.9(15.63)	130.0(19.89)	-0.407	0.684
SDF0	4.085(4.080)	1.790(1.403)	-3.896	0.000***
Fftr	4.475(2.763)	3.840(2.056)	-0.710	0.478
Fatr	3.904(1.946)	3.444(2.415)	-0.658	0.510
Jitter	1.326(0.786)	0.744(0.619)	-3.571	0.000***
RAP	0.770(0.490)	0.492(0.385)	-2.758	0.006**
vF0	3.056(2.922)	1.599(1.157)	-2.987	0.003**
Shimmer	5.855(3.262)	3.653(1.053)	-3.216	0.001***
APQ	4.876(2.532)	3.144(0.991)	-3.490	0.000***
NHR	0.573(1.308)	0.138(0.026)	-2.936	0.003**
Vti	0.169(0.546)	0.037(0.129)	-3.004	0.003**
Ftri	0.689(0.773)	0.273(0.203)	-2.920	0.003**
Atri	3.970(2.380)	3.363(2.972)	-1.198	0.231

** = P<0.01and *** = P<0.001
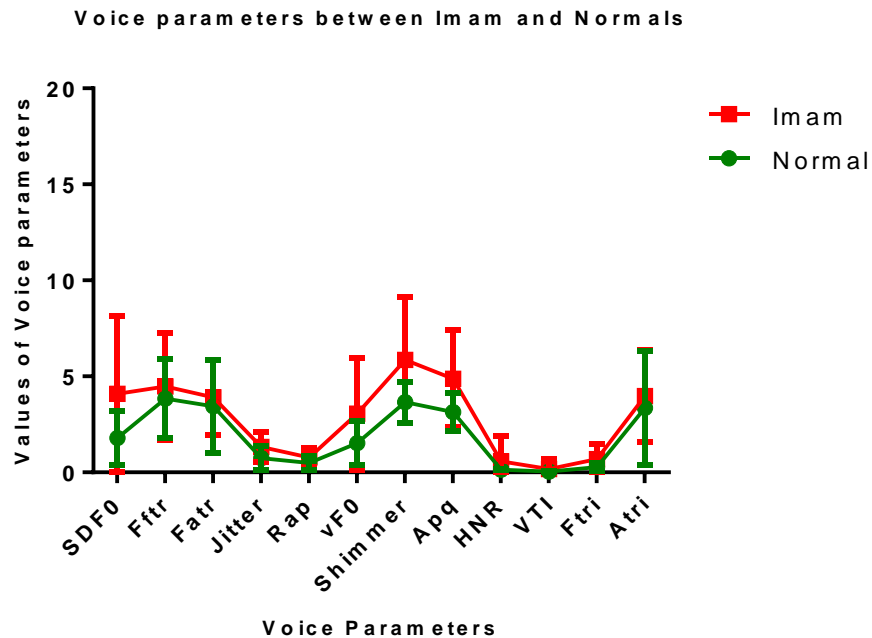
Figure 3.2: Line graph for voice parameters between Imams and Normals

The result of Man-Whitney U test shows significant difference for all the parameters except for Fo, Fftr, Fatr and Atri (P>0.05)between the groups. Statistically significant differences were observed for RAP (Z=-2.758), vF0 (Z=-2.987), NHR (Z=-2.936), VTI (Z=-3.004) and Ftri (Z=-2.920) with significance of P<0.01 and SDFo (Z=-3.896), Jitter (Z=-3.571), Shimmer (Z=-3.216) and APQ (Z=-3.490)with significance of P<0.001.

The data of subgroups of imam were subjected to Man-Whitney U test. No significance differences were seen between the subgroups (age, work experience and voice usage) (P>0.05) and results are displayed in Table 3.5.

Table 3.5: Z value and P value for the comparison of subgroups of imams for acoustic parameters

Parameters	Age		work experience		voice usage	
	Z value	P value	Z value	P value	Z value	P value
F0	-0.402	0.687	-0.963	0.336	-0.352	0.725
SDF0	-0.890	0.374	-0.754	0.451	-0.572	0.567
Fftr	-0.784	0.433	-0.461	0.645	-0.419	0.676
Fatr	-0.10-6	0.916	-0.356	0.722	-1.189	0.235
Jitter	-0.869	0.385	-1.131	0.258	-0.220	0.826
RAP	-1.101	0.271	-1.528	0.126	0.000	1.000
vF0	-1.143	0.253	-1.319	0.187	0.000	1.000
Shimmer	-1.355	0.175	-2.365	0.018	-0.242	0.809
APQ	-0.529	0.596	-1.654	0.098	0.000	1.000
NHR	-0.085	0.932	-0.398	0.691	-1.497	0.134
VTI	-0.678	0.498	-0.021	0.983	-0.837	0.403
Ftri	-0.167	0.865	-0.523	0.601	-0.858	0.391
Atri	-0.445	0.657	-0.084	0.933	-0.220	0.826

Chapter 4

DISCUSSION

The aim of our study was to understand the vocal symptoms and characteristics of Imam by administrating voice survey questionnaire on Imam Group and by comparing the acoustic parameters of voice between imam and normal group.

The voice survey questionnaire was administered on Imam Group to understand their vocal symptoms, their vocal and non-vocal habits and their knowledge over vocal techniques. The result depicts the symptoms and nature of the voice problem. From the response to the questions regarding their position at work and teaching religious lessons it is clear thatthe Imams were frequently subjected to voice usage such as leading prayers, preaching and teaching religious lessons to children. The amount of vocal load is too high in this population since these tasks are done on daily basis.

The Imams also reported to have some inappropriate vocal and non-vocal habits such as shouting, speaking loudly and speaking fast, throat clearing, consuming more than 2 cups of coffee per day, and going to bed soon after the dinner, which in turn elevates the disturbances in their voice. During their course work period they were not exposed to any formal train on voice and vocal techniques this might also be one of factor due to which unnecessary effort can be put during their vocal performances. The findings can be supported by study done by Farahat and Mesallam (2016) where they quoted similar vocal symptoms observed in Saudi Imams. Despite all these inappropriate habits they also had

some positive habits such as proper hydration, taking voice rest and devoid of smoking. Even though they have limited knowledge of voice care they were sensitive to subtle changes in their voice

Acoustic analysis of phonation samples of Imam and Normal Groups were compare to study the vocal characteristics of Imam group. The result of acoustic analysis shows that there is a significant difference in RAP, vF0, NHR, Vti, Ftri, SDFo, Jitter, Shimmer and APQ between Imam and Normal group. These parameters which show significant differences between groups can be classified into three domain such as perturbation related measures(SDF0, Jitter, Shimmer, RAP and vF0), Noise related measures (NHR and VTI), Tremor related measure (Ftri) .

4.1 Perturbation related measure

Relative average perturbation, Jitter, vF0 and shimmer indicate the vocal stability of an individual. RAP, vF0 and Jitter are comprised mainly due to of lack of control in vocal fold vibration whereas shimmer is affected when there is a difficulty to maintain glottis resistance which can be perceptually observed with emission of noise or breathiness. In present study, increased RAP, Jitter, vF0 and Shimmer values in Imam Group indicates that there is instability in their voice. Due to frequent vocal loading the laryngeal system gets fatigue quickly resulting in production of weak and unstable voice.

The SDFo is also one of the acoustic parameter to understand the phonation stability which is found to be higher in Imam Group. Increase in SDF0 again shows the instability of voice resulting in roughness and breathiness.

According to Zyskia et al (1984) High RAP values indicate poor voice quality and vary for different pathological conditions. This supports our findings where increased RAP is seen in Imam Group indicating poor voice quality. Increase in shimmer value can be correlated with breathiness of voice, which is supported by result of a study by Wolfe et al (1997) quoting that amplitude perturbation measures strongly correlates with breathy and hoarse voice. Increased jitter and vF0 values in Imam Group can be due to instability in the vocal cord vibration which creates aperiodicity in the signal resulting in production of roughness in voice. This finding goes along with the findings of other studies. (Rabinov et al, 1995; Wolfe et al, 1997; Munoz et al, 2003)

4.2 Noise related measures

Noise to Harmonic Ratio (NHR)and voice turbulence index (Vti) indicate the aperiodic component in the voice which shows abnormal noise level in the analyzed sample, which can be due to affected quality of voice. In our study NHR is also one of the measure which is found to be higher in Imam Group than the normal group. This can be attributed to the vocal load that the Imams are experiencing and which results in affected voice quality. Increase in NHR is one of the indicator of hyper functional voice disorder. With the regular prayers and preaching they are subjected to excessive vocal loading. According to Krom et al, (1995) NHR is the best predictor of roughness. In concurrent to our findings there are similar studies reporting increase in NHR in hyper functional voice disorders (Bhuta et al, 2004; Petrović-Lazić et al,2011; Schindler et al, 2012).

4.3 Tremor related measure.

Ftri is the parameterof tremor related measures which are found to be affected in the Imam Group. Increase in these parameters indicates the high amount of frequency of tremor in the voice, which again indicates high aperiodicity in the vocal signal caused by the instability and weakness due to the severe vocal loading.

Thus, the result of the current study shows that Imams are encountered with more amounts of voice problems which is reflected in their vocal symptoms as poor vocal and non-vocal habits and vocal characteristics as elevated perturbation, noise and tremor related measures.

Chapter 4

SUMMARY AND CONCLUSION

The current study aimed at investigating the vocal symptoms and characteristics of Imams. A total of 60 participants: 30 Imams and 30 normal individuals were recruited for the study. A voice survey questionnaire was administered on Imams to understand their vocal symptoms. Acoustic analysis was done to study the vocal characteristics of Imam by collecting phonation sample from both the groups.

Frequency count was used to check the outcome of the voice survey questionnaire. Phonation sample was subjected to acoustic analysis using MDVP software and 13 parameters were extracted and compared between the groups.

In general, the outcome of the questionnaire shows that all the participants in the Imam Group have experienced voice problem in their carrier. The cause of voice problem can be attributed to the vocal loading they are subjected to, poor vocal and non vocal habits and their limited knowledge about voice care.

The result of acoustic analysis clearly shows that the Imams present difficulties in sustaining periodic vibration in the vocal cords over a specific time which leads to noise component in the voice, perturbation in period of sustained pitch and sustained amplitude during phonation and greater intensity of voice tremor.

REFERENCES

- Abdelhamid, A., & Al-Khoufi, A. (2017). The effect of voice hygiene advices on Imams' voice during Ramadan. *The Egyptian Journal of Otolaryngology*, *33*(1), 94.

- Al-Bahkaly, S., Nasser, H., Al-Madhari, R., Al-Shehri, H., & Al-Harthi, S. (2016). Prevalence and risk factors of voice disorders among attendants of the Speech Unit at King Abdulaziz Medical City, Riyadh, Saudi Arabia. *Hamdan medical journal,8*(4).

- Bhuta, T., Patrick, L., & Garnett, J. D. (2004). Perceptual evaluation of voice quality and its correlation with acoustic measurements. *Journal of voice*, *18*(3), 299-304.

- Boominathan, P., Rajendran, A., Nagarajan, R., Seethapathy, J., & Gnanasekar, M. (2008). Vocal abuse and vocal hygiene practices among different level professional voice users in India: a survey. *Asia pacific journal of speech, language and Hearing*, *11*(1), 47-53.

- Chasaide, A. N., & Gobl, C. (2002). Voice quality and the synthesis of affect. *Improvements in Speech Synthesis: The Naturalness of Synthetic Speech*, 252-263.

- Devadas, U., Bellur, R., & Maruthy, S. (2017). Prevalence and Risk Factors of Voice Problems Among Primary School Teachers in India. *Journal of Voice*, *31*(1), 117-e1.

- Devadas, U., Navya J., and Dhanshree G. (2016) "Prevalence and Influencing Risk Factors of Voice Problems in Priests in Kerala." *Journal of Voice* 30.6: e17-e27.

- Farahat, M., & Mesallam, T. A. (2016). Psychosocial Assessment of Voice Problems among Saudi Imams. *British journal of medical and medical sciences,* 11(12): 1-7

- Hagelberg, A. M., & Simberg, S. (2015). Prevalence of voice problems in priests and some risk factors contributing to them. *Journal of Voice*, *29*(3), 389-e11.

- Krom, G. (1995). Some spectral correlates of pathological breathy and rough voice quality for different types of vowel fragments. *Journal of Speech, Language, and Hearing Research*, *38*(4), 794-811.

- Munoz, J., Mendoza, E., Fresneda, M. D., Carballo, G., & Lopez, P. (2003). Acoustic and perceptual indicators of normal and pathological voice. *Folia Phoniatrica et logopaedica*, *55*(2), 102-114.

- Nallamuthu, A., & Boominathan, P. (2011). A survey of voice related concerns in elderly collge teachers. *Journal of the All India Institute of Speech & Hearing*, *30*.

- Petrović-Lazić, M., Babac, S., Vuković, M., Kosanović, R., & Ivanković, Z. (2011). Acoustic voice analysis of patients with vocal fold polyp. *Journal of Voice*, *25*(1), 94-97.

- Pitchaimuthu, M. A. N., Radish Kumar, B., Phadke, K. V., Fernandes, J. B., & Bhat, J. S. (2015). Nonlinear dynamic analysis of voice in teachers with dysphonia. *Asian Journal of Science and Technology*, *6*(06), 1479-1481.

- Rabinov, C. R., Kreiman, J., Gerratt, B. R., & Bielamowicz, S. (1995). Comparing reliability of perceptual ratings of roughness and acoustic measures of jitter. *Journal of Speech, Language, and Hearing Research*, *38*(1), 26-32

- Rajasudhakar, R., Pramoda, K., Yeshoda, K., & Geetha, Y. V. (2011). AN Evaluate study of vocal hygiene awareness program in professional voice users (Prospective teachers). *Journal of the All India Institute of Speech & Hearing*, *30*.

- Rechenberg, L., Goulart, B. N. G. D., & Roithmann, R. (2011). Impact of call center work in subjective voice symptoms and complaints: an analytic study. *Jornal da Sociedade Brasileira de Fonoaudiologia*, *23*(4), 301-307.

- Reed, J. P., & Sims, H. S. (2017). Comparative Analysis of Characteristics of Voice Use Amidst Clergy. *Journal of Voice*, *31*(2), 256-e7.

- Russell, A., Oates, J., & Greenwood, K. M. (1998). Prevalence of voice problems in teachers. *Journal of voice*, *12*(4), 467-479.

- Russell, A., Oates, J., & Greenwood, K. M. (1998). Prevalence of voice problems in teachers. *Journal of voice*, *12*(4), 467-479.

- Schiller, I. (2017). Prevalence of voice disorders among teachers at the beginning of their career.

- Schindler, A., Mozzanica, F., Ginocchio, D., Maruzzi, P., Atac, M., & Ottaviani, F. (2012). Vocal improvement after voice therapy in the treatment of benign vocal fold lesions. *Acta Otorhinolaryngologica Italica*, *32*(5), 304.

- Servilha, E. A. M., & Costa, A. T. F. D. (2015). Knowledge about voice and the importance of voice as an educational resource in the perspective of university professors. *Revista CEFAC*, *17*(1), 13-26.

- Simberg, S., Laine, A., Sala, E., & Rönnemaa, A. M. (2000). Prevalence of voice disorders among future teachers. *Journal of voice*, *14*(2), 231-235.

- Van Riper, C. (1972). *Speech correction*. Prentice-Hall.

- Wolfe, V., Fitch, J., & Martin, D. (1997). Acoustic measures of dysphonic severity across and within voice types. *Folia Phoniatrica et Logopaedica*, *49*(6), 292-299.

- Zyski, B. J., Bull, G. L., McDonald, W. E., & Johns, M. E. (1984). Perturbation analysis of normal and pathologic larynges. *Folia Phoniatrica et Logopaedica*, *36*(4), 190-198.