FACTORS AFFECTING VOICE THERAPY OUTCOME IN ADULTS WITH VOICE DISORDERS

TIPWAREE AUEWORAKHUNANAN

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……...
Ms. Tipwaree Aueworakhunanan,
Candidate

……...
Mrs. Kalyanee Makarabhirom,
Ph.D. (Neurosciences)
Major advisor

……...
Assoc. Prof. Dechavudh Nityasuddhi,
Ph.D. (Statistics)
Co-advisor

……..
Prof. Patcharee Lertrit,
M.D., Ph.D. (Biochemistry)
Dean
Faculty of Graduate Studies
Mahidol University

……...
Assoc. Prof. Krisna Lertsukprasert,
M.A. (Communication Disorders)
Program Director
Master of Science Program
In Communication Disorders
Faculty of Medicine
Ramathibodi Hospital
Mahidol University

Thesis
entitled

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was submitted to the Faculty of Graduate Studies, Mahidol University
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on
August 10, 2015

.....
Ms. Tipwaree Aueworakhunanan,
Candidate

.....
Assist. Prof. Sriwimon Manochiopinig,
Ph.D. (Communication Disorders)
Chair

.....
Assoc. Prof. Dechavudh Nityasuddhi,
Ph.D. (Statistics)
Member

.....
Mrs. Kalyanee Makarabhirom,
Ph.D. (Neurosciences)
Member

.....
Prof. Patcharee Lertrit,
M.D., Ph.D. (Biochemistry)
Dean
Faculty of Graduate Studies
Mahidol University

.....
Prof. Winit Phuapradit,
M.D., M.P.H. (Maternal and Child Health)
Dean
Faculty of Medicine
Ramathibodi Hospital
Mahidol University

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Tipwaree Aueworakhunanan

FACTORS AFFECTING VOICE THERAPY OUTCOME IN ADULTS WITH VOICE DISORDERS

TIPWAREE AUEWORAKHUNANAN 5536258 RACD/M

M.Sc. (COMMUNICATION DISORDERS)

THESIS ADVISORY COMMITTEE: KALYANEE MAKARABHIROM, Ph.D., DECHAVUDH NITYASUDDHI, Ph.D.

ABSTRACT

The purpose of this research was to examine factors affecting voice therapy outcome and to investigate the direct and indirect factors affecting quality of life in adults with voice disorders at the speech clinic in Ramathibodi Hospital. The subjects consisted of 36 patients with voice disorders. All subjects received 10 sessions of voice therapy, each session 30 minutes per week. The voice therapy program consisted of vocal hygiene education, breathing exercise, muscle relaxation and others. Voice therapy outcome was measured by using the Grade, Instability, Roughness, Breathiness, Asthenicity, and Strain (GIRBAS) criteria and Dr. Speech program and quality of life was measured by using the Voice Handicap Index version in Thai. Obtained data were analyzed by using Descriptive and Inferential statistics (Chi-square test, Fisher's Exact test, Independent t-test and Mann-Whitney test).

It was found that the voice quality after voice therapy was significant better than before therapy ($p < 0.001$). The factors, such as severity of voice disorders, voice usage, accuracy and progression of voice therapy at speech clinic were significantly affected by voice therapy outcomes ($p = 0.006$, 0.016, 0.021 and 0.009 respectively). The quality of life after voice therapy was significantly better than before voice therapy ($p < 0.001$). Only duration of voice disorders, an indirect factor was affected by quality of life ($p = 0.040$). This finding suggested that, speech and language pathologists should consider these factors during voice therapy in adults with voice disorders.

KEY WORDS:VOICE DISORDERS/ VOICE THERAPY/
ADHERENCE FACTORS/ QUALITY OF LIFE

96 pages

ปัจจัยที่มีผลต่อผลของการฝึกพูดในผู้ใหญ่เสียงผิดปกติ

FACTORS AFFECTING VOICE THERAPY OUTCOME IN ADULTS WITH VOICE DISORDERS

ทิพยวารี เอื้อวรคุณานันท์ 5536258 RACD/M

วท.ม.(ความผิดปกติของการสื่อความหมาย)

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บทคัดย่อ

งานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยที่มีผลต่อผลการฝึกพูดและปัจจัยทางตรงและทางอ้อมที่มีผลต่อคุณภาพชีวิตในผู้ใหญ่เสียงผิดปกติ ที่คลินิกฝึกพูด โรงพยาบาลรามาธิบดี จำนวน 36 ราย ระยะเวลาในการฝึกพูด 10 สัปดาห์ สัปดาห์ละครั้ง ครั้งละ 30 นาที ด้วยวิธี การให้คำแนะนำการรักษาสุขอนามัยเส้นเสียง การฝึกหายใจ การบริหารผ่อนคลายกล้ามเนื้อ เป็นต้น แล้ววัดผลการฝึกพูดโดยวัดคุณภาพเสียงจากเกณฑ์ Grade, Instability, Roughness, Breathiness, Asthenicity, and Strain (GIRBAS) และจากโปรแกรม Dr.Speech และวัดผลคุณภาพชีวิตจากการตอบแบบสอบถาม The voice handicap index ฉบับภาษาไทย วิเคราะห์ข้อมูลด้วยสถิติเชิงพรรณนาและเชิงอนุมานด้วย Chi-square test, Fisher's Exact test, Independent t-test และ Mann-Whitney test

ผลการศึกษาพบว่าคุณภาพเสียงหลังการฝึกพูดดีขึ้นกว่าก่อนการฝึกอย่างมีระดับนัยสำคัญทางสถิติ ($p < 0.001$) และปัจจัยที่มีผลต่อผลของการฝึกพูด คือ ระดับความรุนแรงของเสียงผิดปกติ ปริมาณการใช้เสียง ความถูกต้องในการฝึกพูดที่คลินิกฝึกพูดและความก้าวหน้าในการฝึกพูดที่คลินิกฝึกพูด ($p = 0.006$, $p = 0.016$, $p = 0.021$ และ $p = 0.009$ ตามลำดับ) ส่วนคุณภาพชีวิตหลังการฝึกพูดดีขึ้นกว่าก่อนการฝึกอย่างมีระดับนัยสำคัญทางสถิติ ($p < 0.001$) และความสัมพันธ์ระหว่างปัจจัยทางตรงและทางอ้อมที่มีผลต่อคุณภาพชีวิต พบว่า มีเพียงปัจจัยทางอ้อม ปัจจัยเดียว คือ ระยะเวลาของการเกิดเสียงผิดปกติมีผลต่อคุณภาพชีวิต ($p = 0.040$) จากการศึกษาครั้งนี้ เห็นว่า นักแก้ไขการพูดควรคำนึงถึงปัจจัยเหล่านี้ในช่วงการฝึกพูดในผู้ใหญ่เสียงผิดปกติ

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LIST OF ABBREVIATIONS

GRBAS	The Grade, Roughness, Breathiness, Asthenicity, and Strain
GIRBAS	The Grade, Instability, Roughness, Breathiness, Asthenicity, and Strain
CAPE-V	Consensus Auditory – Perceptual Evaluation of Voice
NNE	Normalized noise energy
NHR	Noise to harmonic ratio
CSL	Computerized Speech Lab
MDVP	Multi-Dimensional Voice Program
GHD	The Göttingen Hoarseness Diagram
SLP	Speech-language pathologists
VHI	The voice handicap index
ENT	The Ear, Nose, and Throat
V – RQOL	The Voice – Related Quality of Life
VOS	The Voice Outcome Survey
VoiSS	The Voice Symptom Scale
EPC	The Evidence-based Practice Center
WHO	World Health Organization
VHI-TH	The voice handicap index version Thai language
T-VHI-TH	The total subscale of the voice handicap index version Thai language
F-VHI-TH	The functional subscale of the voice handicap index version Thai language
P-VHI-TH	The physical subscale of the voice handicap index version Thai language
E-VHI-TH	The emotional subscale of the voice handicap index version Thai language

CHAPTER I
INTRODUCTION

1.1 Background of the study

Speech production is a psychomotor operation that occurs from the complex interactions between anatomical and physiological systems. These systems include cognitive-emotion, neuromotor, respiration, phonation, resonation and articulation (1). The initiation process arises from the intention to create speech and expresses that speech into words, phrases or sentences by the speech organ. Speech is produced principally during the exhalation phase of the respiratory system. The air stream from the lungs goes through the trachea and oro-naso-pharygeal cavities. The trachea has the larynx and the vocal folds. When the air stream passes the larynx, the vocal folds are vibrated. The vibration of the vocal folds makes sound waves. Then the sound waves go to the cavities where resonation occurs. In this process, the listener cannot understand the sound because it is a standing wave. The speaker uses the articulatory system that changes the standing wave to speech sound (words, phrases or sentences). In addition, speech sounds consist of pitch and loudness mechanisms that make intonation to help the listeners understand the meaning and emotional intention of speech by adjusting the anatomy and physiology of the larynx, such as vocal folds length, vocal folds tension, the amount of airflow from the lung, etc. (1-2). The speech sounds, which are considered effective communication, must be in good quality. This means they must have suitable pitch for age and gender, and appropriate loudness for the listener to hear. They must also be clear and intelligible. Such effective communication can be used to communicate in both the workplace and society (2-3). A speaker with voice disorders will be affected by their loss of communication. Effects include the loss of occupation, the loss of income, and a drop in quality of life (4).

Voice disorders are the speech sounds where quality, pitch, or loudness differs significantly from those of other people in the same age, gender, cultural

background, and geographical location. These characteristics can be perceived by the speaker or listener (5-7). There are several classification types of voice disorders. Stemple et al. (6) has classified the voice disorders into five categories according to etiologies. These categories include structural changes in the vocal fold (e.g. vocal nodule, Reinke's edema, laryngitis, etc.), neurogenic voice disorders (e.g. recurrent laryngeal nerve palsy, spasmodic dysphonia, etc.), systemic disease contributors to laryngeal pathology (e.g. pharmaceutical effects, endocrine influences, etc.), disorders of voice usage (e.g. vocal fatigue, vocal abuse and misuse, etc.), and idiopathic voice disorders (e.g. congenital airway anomalies).

The prevalence of voice disorders in the general adult population is 29.9% (8). The most common laryngeal pathology is functional voice disorders, followed by vocal nodules and pharyngolaryngeal reflux (9). The most common age range having voice disorders is between 45-64 years old (9-10). New patients with voice disorders in the speech clinic at Ramathibodi Hospital in January 2012-September 2014 were 19.8% of all patients with voice disorders. The most common age range was between 56-60 years old (11). Patients with voice disorders normally complain about the symptoms of their voice including hoarseness, vocal fatigue, breathy voice, reduced phonation range, aphonia, pitch break or inappropriately high pitch, strain, tremor, and pain. These symptoms frequently happen in combination (12).

The evaluation and measurement of voice therapy progression come from perceptual and objective evaluations (2-3). The perceptual voice evaluation depends on the speech-language pathologist's auditory skills. It has several criteria and forms such as The Buffalo voice profile by Wilson (13), The Grade, Roughness, Breathiness, Asthenicity, and Strain (GRBAS) by Hirano (14), The Grade, Instability, Roughness, Breathiness, Asthenicity, and Strain (GIRBAS) by Dejonckere et al. (15), The Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) by Kempster et al (16), etc. The objective voice evaluation shows visual feedback or defines the severity of voice disorders. It is easier to analyze acoustic parameters using objective voice evaluation over using perceptual voice evaluation. These acoustic parameters include fundamental frequency (17), jitter, shimmer (6), normalized noise energy (NNE) (18), and noise to harmonic ratio (NHR) (19). There are several types of software to analyze acoustic parameters such as Computerized Speech Lab (CSL) with Multi-Dimensional

Voice Program (MDVP) by Kay Elemetrics, Dr. Speech by Tiger DRS, The Göttingen Hoarseness Diagram (GHD) by Göttingen University, and Praat by Amsterdam University, etc.

Furthermore, the quality of life evaluation was an instrument to measure the handicap from voice disorders in realized situation. It was important to understand how patients perceive their own disorders. The most reliable questionnaire that was used to evaluate the severity of the handicap from several types of voice disorders, and to measure the effectiveness of various therapies such as behavioral, medical, and surgical treatments of voice disorders in the clinic was The Voice handicap index (VHI) by Jacobson et al. (20). The contents of the VHI questionnaire have been translated and adapted into many languages such as German, Spanish, Portuguese, Dutch, Hebrew and Chinese (21). Recently, the contents of VHI have been translated into Thai by Jaruchinda et al. (22).

There were several treatments for patients with voice disorders, such as medicine, surgery and voice therapy. Voice therapy was a method in which pathologists treated patients with voice disorders. Voice therapy had been treated by speech-language pathologists (SLP) since 1930 (6). There were several philosophies of voice therapy including hygienic, symptomatic and physiologic voice therapy (23). Presently, voice therapy was divided into two methods. These methods were indirect and direct voice therapies. The indirect voice therapy supported and maintained the factors that can affect voice problems, including eliminating any vocal abuse or misuse. It indirectly treated the laryngeal mechanism. On the other side, the direct voice therapy was a method to treat the laryngeal mechanism directly, by modifying the incorrect voice production which includes respiration, phonation, resonation and articulation (24). For example, direct voice therapy techniques are the yawn-sigh approach (2, 6-7, 17, 23, 25-26), breathing exercises (2, 5-7, 12, 17, 25, 27), soft glottal attacks (2, 7), muscle relaxation (1-2, 5-7, 17, 23, 25-26), resonant voice therapy (6, 12, 23), and pushing exercises (6, 12, 17, 23, 25). An effective duration of the voice therapy program was 30-60 minutes per session, 1-2 sessions per week, for 2-3 months (2, 19, 28-31)

As mentioned above, voice therapy had prolonged period to follow-up so that the success of voice therapy program was related to patient adherence (32).

Adherence was defined as an active collaboration between patients and their health professionals. This active collaboration worked to achieve therapeutic success and the completion of the treatment (12, 20-22, 33-40). There were five groups of factors related to adherence, each with their own multidimensional phenomenon (33). The first group was the social and economic factor, such as poor socioeconomic status, a low level of education, unemployment, any long distance from the treatment clinic, the high cost of medication, etc. These group included age, gender, race, marital status, health status, etc. The second group was the health care team and system-related factors, including the relationship between patient and clinician, the system to educate patients and provide follow-up, distribution systems, etc. The third group was the condition-related factors, such as the severity of symptoms, the level of disability, the rate of progression, the severity of the disease, the availability of effective treatments, etc. The forth group was the therapy-related factors, such as the duration of treatment, any frequent changes in treatment, the immediacy of beneficial effects, etc. The fifth group was the patient-related factors, such as knowledge level, attitude, belief, perception, expectation, etc. (16).

In the past, many studies found the several factors such as gender, age, occupation, types of voice disorders, duration of voice disorders, health condition, voice therapy approach, period of the voice therapy program, the waiting time between otolaryngology referral and speech-language pathology evaluation, the number of voice therapy sessions, the accuracy of voice therapy, etc. affected to voice therapy outcome (2, 32, 35) or quality of life (20, 39-53) in the patient with voice disorders but they did not classify the factors according to adherence factors. Moreover many researches were limited the patient's characteristics to find the relationship between factors affecting voice therapy outcome or quality of life such as Makarabhirom (2) only studied in patients with vocal nodules or Chen et al. (48) only studied in female teachers.

1.2 Problem statement

As mentioned above, there have been many researches that were documented only the factors affecting voice therapy outcomes (2, 32, 35) or affecting

quality of life (20, 39-53) and did not classify the factors according to adherence factors. Despite the fact, the factors influencing voice therapy outcomes and quality of life had similarities and differences. But these research studies did not examine the factors influencing both voice therapy outcomes and quality of life. In this study, the researcher will investigate and assess the factors focusing on group of adherence factors affecting voice therapy outcome and the factors affecting quality of life in all patients with voice disorders.

1.3 Purpose statement

The purpose of this research is to examine:

1.3.1 The factors affecting voice therapy outcome in adult with voice disorders

1.3.2 The direct and indirect factors affecting quality of life in adult with voice disorders

1.4 Research questions

There are three research questions of this study as mentioned below:

1.4.1 What are the factors affecting voice therapy outcome in adult with voice disorders?

1.4.2 What are the direct factors affecting quality of life in adult with voice disorders?

1.4.3 What are the indirect factors affecting quality of life in adult with voice disorders?

1.5 Research hypothesis

The hypotheses of this study are as follows:

1.5.1 It was hypothesized that there were statistically significant correlation between all 5 major groups of adherence factors based on the finding from

World Health Organization (WHO) (33) (including gender, education, occupation, health status, referring period to SLP, duration of voice disorders, type of vice disorders, severity of voice disorders, voice usage, vocal abuse behaviors, accuracy of voice therapy at speech clinic, progression of voice therapy at speech clinic, dosage of voice therapy at home, patient's satisfaction to voice therapy service, patient's attitude to voice therapy, etc.) and voice therapy outcome,.

1.5.2 All 5 major groups of adherence factors are direct factors related to quality of life in adult with voice disorders (36-46, 157).

1.5.3 All 5 major groups of adherence factors involving with voice therapy outcome are indirect factors related to quality of life in adult with voice disorders (21, 42, 48-52).

1.6 Significance of the study

The significances of this study are as follows:

The result of the study can be a noticification for SLP to concern the direct and indirect factors (i.e. gender, education, occupation, health status, referring period to SLP, duration of voice disorders, type of vice disorders, severity of voice disorders, voice usage, vocal abuse behaviors, accuracy of voice therapy at speech clinic, progression of voice therapy at speech clinic, dosage of voice therapy at home, patient's satisfaction to voice therapy service, patient's attitude to voice therapy, etc.) affecting voice therapy outcome and quality of life in adult with voice disorders.

1.7 Limitation

Demographic variables were limited according to age and gender.

1.7.1 The most common age range was 56-60 years old. The subjects were retirement-age (11) and could attend at least 80% of their voice therapy program's sessions.

1.7.2 The most common gender was female. Females have a greater tendency for voice disorders than males do, because of structural differences in laryngeal anatomy (10).

1.8 Definitions of key terms

The following definitions used in this study are:

1.8.1 Voice disorders refer to the speech sounds in which quality, pitch, or loudness differs significantly from those of other people in the same age, gender, cultural background and geographical location (6).

1.8.2 Voice therapy refers to the method in which SLP treats patients with voice disorders. These methods are indirect and direct voice therapies. The indirect voice therapy supports and maintains the factors that can affect voice problems including eliminating the vocal abuse/misuse. It indirectly treats the laryngeal mechanism. On the other side, the direct voice therapy is a method to treat the laryngeal mechanism directly by modifying the incorrect voice production which includes respiration, phonation, resonation and articulation (24).

1.8.3 Adherence factors refer to 5 groups of factors affecting voice therapy. The first group is the social and economic factor, such as poor socioeconomic status, a low level of education, unemployment, any long distance from the treatment clinic, the high cost of medication, age, gender, race, status and etc. The second group is the health care team and system-related factors, such as the relationship between patients and clinicians, the system to educate patients and provide follow-up, distribution systems and etc. The third group is the condition-related factor, such as the severity of symptoms, the level of disability, the rate of progression, the severity of the disease, and the availability of effective treatments and etc. The forth group is the therapy-related factor such as the duration of treatment, any frequent changes in treatment, the immediacy of beneficial effects and etc. The fifth group is the patient-related factor, such as knowledge level, attitude, belief, perception, expectation and etc. (16).

1.8.4 Quality of life refers to the individuals' perception of their position in life in the context of the culture and value systems in which they live and relate to their goals, expectations, standards and concerns (53).

1.9 Conceptual framework

The researcher defines framework of this study as follows:

The dependent variables (X) are all 5 major groups of adherence factors. There are social and economic factors (gender, education, occupation and health status), health care team and system (referring period to SLP), voice health condition (duration of voice disorders, type of voice disorders, severity of voice disorders, voice usage and vocal abuse behaviors) treatment (accuracy and progression of voice therapy at speech clinic and dosage of voice therapy at home) and patient perception (patient's satisfaction to voice therapy service and patient's attitude to voice therapy). While the independent variables (Y) are the effectiveness of voice therapy which measured by using perceptual and objective assessment of voice qualities and quality of life assessment. Factors which are analyzed to find the relationship with voice therapy outcome are the result of objective voice assessment after voice therapy. The direct factors for quality of life which are the result of quality of life assessment before voice therapy. The indirect factors for quality of life are the result of quality of life assessment after voice therapy (Figure 1.1).

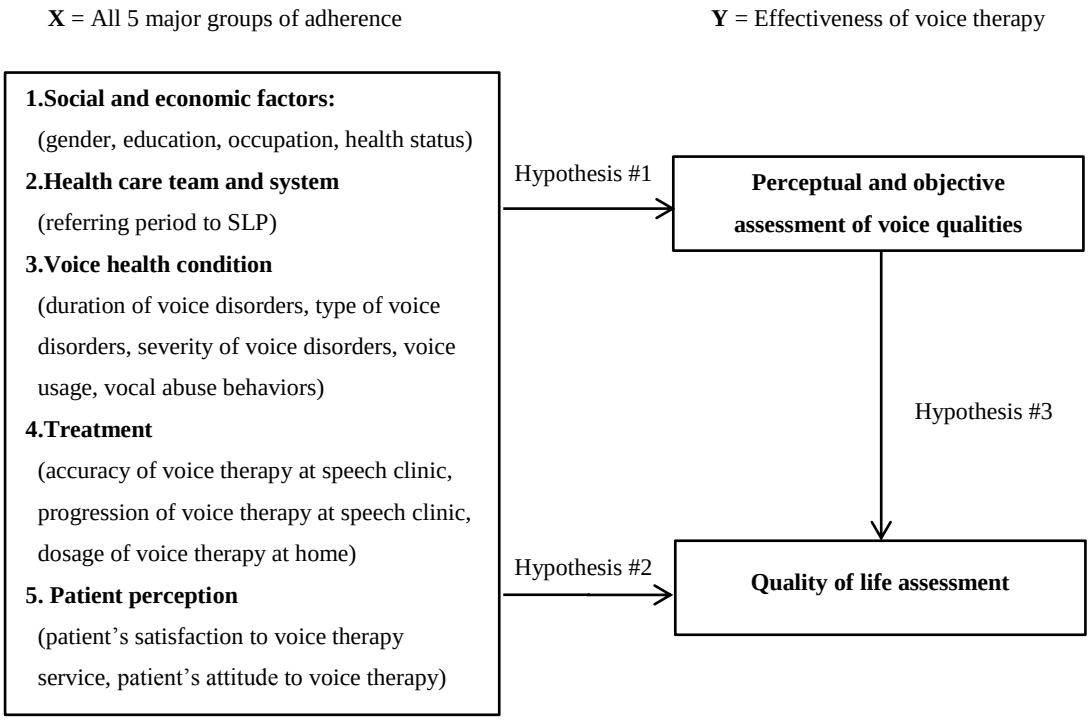

Figure 1.1 Flowchart represent the conceptual framework of the study

CHAPTER II
LITERATURE REVIEW

This chapter describes about speech production, voice disorders, voice evaluation, voice disorders treatment and focuses on factors relating to voice therapy outcome.

2.1 Speech production

Speech production is a psychomotor system that arises from the sophisticated interactions between anatomical and physiological systems. These systems include cognitive-emotion, neuromotor, respiration, phonation, resonation and articulation (1). The first step of speech production is cognitive skill which is used to aware the idea that shows the speaker's intention. Then, cognition interacts with linguistic process, resulting in language formulation (54). Through a collaboration with the emotional system, the speaker's intention and personality are presented (1). The primary motor act of speech from the neuromotor system has many connections to the thalamus. Particular ventrolateral nucleus of the thalamus responds to the initiation of speech movement and controls loudness, pitch, rate and articulation (1, 12, 55). Within brainstem, the nucleus ambiguous, nucleus tractus solitarii, and nucleus parabranchialis relate to neural control of phonation. Many interconnections including cerebellar network occur in these areas. Their major role is respiration control (56) and their minor roles are laryngeal muscles and vocalization control (1, 12) while the role of cerebellum is help to coordinate laryngeal muscles that are necessary for phonation (1, 12, 57). The important peripheral connection is the vagus nerve (CN X) that plays in the sensory and motor functions of all the areas of pharynx, larynx and esophagus. Particular the second branch of CN X is superior laryngeal branch that provides the sensation of the larynx and pharynx, and supplies the cricothyroid muscles for the

modification of pitch. Its third branch is the recurrent laryngeal branch that serves all intrinsic laryngeal muscles.

In respiratory systems, the roles of human respiration are exchanging oxygen within cell body and using an air stream to activate vocal folds vibration for speech tasks. In general, the rib cage wall of the respiratory function expands in 3 dimensions. The base of rib cage links to the diaphragm. When a human inhales, the diaphragm contracts and descends to the abdominal cavity and the abdominal wall has outward position. But when a human has expiration, the diaphragm releases then the abdominal wall goes back to the same position. In term of inspiratory-expiratory ratio of tidal volume (TV), the timing of inspiration is slightly longer than expiration during phonation so that they have enough air streams to continue speech tasks (58-60). The air stream of expiration is arisen fluctuations according to emotion, stress, loudness and tone of the speaker (58-59).

For the phonatory systems, the important structure is the larynx. It plays a role in phonation by using the laryngeal valving mechanism. In the laryngeal box, there are true vocal folds which abduct for inspiration before the phonation period. For the beginning of the phonation period, it starts-up the expiration process. The subglottal air pressure builds up enough to open the vocal folds. The air flow from the lung passes between the vocal folds. The vocal folds are vibrated when the subglottal air pressure drops. The vocal folds move together again according to the aerodynamic-myoelastic theory. This act is known as Bernoulli's effect and is counted a cycle vocal folds vibration (2, 25, 61). The loudness of voice relates to subglottal and transglottal air pressure (25, 60). The loud voice uses a higher level of subglottal air pressure than whisper voice (60). While the pitch relates to the length and mass of the vocal folds. The length of the vocal folds for high pitch is longer than low pitch because the vocal folds are very tension and have many cycle vocal fold vibrations. The mass of the vocal folds for high pitch is smaller than low pitch.

Next the resonatory system reflects the acoustic response of air molecules from the larynx within the vocal tract that consists of nasal, oral and pharyngeal cavities. The vocal tract performs as a resonator (60). The size and shape of the cavities are modified by the movement of the articulators that relate to the various resonance. The higher frequency is showed the best resonating effect by a fairly high

level of pharyngeal wall tension. The lower frequency is showed the better amplifier by the pharyngeal wall relaxation (25, 61).

The last is articulation system which supports the manipulations of the size-shape adjustment within the vocal tract during phonation. This act is achieved by the movement of the articulators which are lips, jaws, tongue, palate and pharynx (26, 62-64). These articulators function to produce vowels, consonants, and tones (65).

2.2 Voice disorders

Voice disorders are the speech of sound in which the quality, pitch or loudness differing significant from those of other people in the same age, gender, cultural background and geographical location (6). These characteristics can be perceived by the speaker or listener (5-7). The abnormal voice quality includes hoarseness, harshness and breathiness (65). Abnormalities of pitch are too high or too low; they do not sound appropriate for the speaker's age or gender. Abnormalities of loudness are too loud or too soft; it does not sound suitable in certain situations (5, 66).

There are several criterias to organize the type of voice disorders, according to the etiology, pathology, function and etc.

There are 5 types of voice disorders related to etiology (6). The first type is structural changes in the vocal fold such as vocal nodule, vocal polyp, Reinke's edema, vocal cyst, sulcus vocalis, vocal fold hemorrhage, laryngitis, vocal fold granuloma, vocal fold papilloma, vocal fold web, presbylaryngeus, vocal fold leukoplakia and vocal fold carcinoma. The second type is neurogenic voice disorders including recurrent laryngeal nerve paralysis, superior laryngeal nerve paralysis, spasmodic dysphonia, vocal tremor and other neurogenic disorders (myasthenis gravis, dystonia, multiple sclerosis, Huntington's chorea, Parkinson's disease, amyotrophic lateral sclerosis). The third type is systemic disease that contributes to laryngeal pathology such as pharmaceutical effects, endocrine influences (growth hormone, thyroid function, sex hormonal imbalances), immunologic diseases (rheumatoid arthritis, allergies), infectious diseases (respiratory diseases) and esophageal reflux. The fourth type is disorders of voice use such as muscle tension dysphonia, vocal fatigue, vocal abuse and misuse, ventricular phonation, puberphonia or mutational

falsetto, transgender voice, psychogenic dysphonia and conversion aphonia. The last type is idiopathic voice disorders such as paradoxical vocal fold motion and congenital airway anomalies (laryngomalacia or subglottic stenosis).

The 3 types of voice disorders related to pathology are organic, functional, and idiopatic voice disorders (67-69). First, organic voice disorders affect the anatomy or physiology of the larynx or other areas of the vocal tract, and include vocal fold paralysis, laryngeal webs, vocal fold papilloma, vocal fold edema, benign vocal fold, vocal fold granuloma, neurologic or endocrine disease, and reflux laryngitis or laryngitis (9-10). Second, functional voice disorders which are associated with the absence of laryngeal pathology include vocal abuse and misuse, ventricular dysphonia, psychogenic voice disorders, conversion dysphonia and mutational falsetto. Third, the idiopathic voice disorders are related to several varieties of etiologies such as spasmodic dysphonia.

There are 4 types of voice disorders according to function or intervention techniques (7, 9-10). The first type is vocal hyperfunction including excessive laryngeal tension or extremely forceful closure of the vocal folds. The second type is vocal hypofunction including incomplete closure of the vocal folds and also involving the neurogenic voice disorders. The third type is psychogenic voice disorders that occur from psychological or emotional factors. The last type is spasmodic dysphonia that results in abnormalities of vocal fold approximation.

The classification of type of voice disorders in this study was adapted from Roth and Worthington (7), Aronson (67), Prater and Swift (68) and Wilson (69). The researcher organized two groups, the organic voice disorders group and the nonorganic voice disorders group. The organic voice disorders group included disorders caused by structural abnormalities (e.g., vocal nodules, polyps and cysts) or neurological abnormalities (e.g., vocal fold paresis and paralysis) within the larynx (9). On the other hand, the nonorganic voice disorders group included the other voice disorders that were not collected in the first group.

Voice disorders are prevalent, affecting 3-10% of the general population (70). The most common age range of people with voice disorders is 45-64 years old (9-10). In Thailand at Ramathibodi Hospital, from January 2012 to September 2014, 19.8% of new cases of voice disorders, were between 56-60 years old (11).

Most patients with voice disorders have more than one symptom. These symptoms include hoarseness, breathy voice, vocal fatigue, reduced pitch range, aphonia, pitch break, inappropriately high pitch, strained voice, tremor, pain and other physical sensation (12).

2.3 Voice evaluation

To effectively evaluate voice disorders, evaluations of medical treatments, voice, and the person's quality of life must be done. Regarding evaluations, The European Laryngological Society suggested that the basic set evaluations of common voice disorders are perceptual voice evaluation, videostroboscopy, acoustic evaluation or instrumental and subjective rating by patients (60).

Medical evaluation is the role of the ears, nose and throat (ENT) doctor whose job is to accurately check the larynx, via indirect laryngoscopy, direct laryngoscopy or video strobolaryngoscopy (71-74).

Voice assessment is divided into two methods, which are perceptual and objective voice evaluation (2-3). The perceptual voice evaluation depends on the auditory experience of the listener, particularly the SLP, to consider breathing during phonation, the duration of breathing, maximum phonation time (MPT), pitch, loudness, voice quality and etc. (1-3). In general, perceptual voice evaluation has different patterns that depends on different groups of SLP's to form a consensus for example The Buffalo Profile (13), GRBAS (14), GIRBAS (15), and CAPE-V (16). However the perceptual voice evaluations did not show the acoustic parameters, or the number of the progression after voice therapy (75). In contrast, objective voice evaluation shows the results of acoustic parameters in pictures, or identifies the number of severity of voice disorders (2-3). Common acoustic parameters such as the fundamental frequency, jitter, shimmer and NHR are analyzed. The software programs in many devices such as CSL, DRS, GHD, etc. are used to analyze the acoustic parameters.

Moreover the quality of life evaluation focuses on the patients' handicap in their daily life, and how it directly affects their wellness, such as working area, classroom, etc. Because the doctors or the SLP do not stay in this situation, they may

not perceive handicaps from voice disorders the same as the patients do. There are several questionnaires that are used for evaluation such as VHI (21), The Voice – Related Quality of Life (V – RQOL) (76), The Voice Outcome Survey (VOS) (77) and The Voice Symptom Scale (VoiSS) (78). The measurements from the Evidence-based Practice Center (EPC) (79) team for instrumental reliability, validity and availability of normative data in voice disorders proposed that the VHI was the strongest.

2.4 Voice disorders treatment

There are several treatments according to etiology and pathology within the larynx. In general, the three approaches for treatments are surgery, medicine and voice therapy (12, 76). The goals of the surgical treatment are protection, reconstruction or improving laryngeal function, swallowing and respiration. Moreover, surgery treatment is often combined with medical treatment and voice therapy for more beneficial outcome to patients (2, 12, 80).

Medical treatment performs a large role in the treatment of several conditions. The typical diseases such as infection, allergy, laryngopharyngeal reflux, systemic disease, and neurological conditions require treatment from the otolaryngologists because they are experts in medicine and pharmacology (76).

Voice therapy is emphasized to improve or modify the behavior of voice usage and to eliminate the factors affecting voice problems (24) in order to have appropriate voice usage in daily living or have the best voice quality as possible (2, 6, 12). An effective duration for voice therapy programs is 30-60 minutes per session, 1-2 sessions per week, for 2-3 months (2, 19, 28-31). There are 7 steps in the main guideline to use for the voice therapy program. In the first step, the SLP describes the causes of voice disorder, etiologies of voice disorders, effects from voice disorders, voice therapy programs, processes of voice therapy, durations of voice therapy and preventions of voice disorders (12, 17, 81-82). In the second step, an ENT doctor diagnoses patients before voice therapy (2) and meets again after completing voice therapy program (81). In the third step, the SLP must evaluate the patient’s voice quality before the voice therapy program by tape recording or other instruments and

should evaluate them during the voice therapy program to present the progression of voice therapy (81, 83). In the fourth step, the SLP chooses the appropriate and easy voice approaches for patients, increasing a good patient's attitude and motivation (2, 12). In the fifth step, the SLP uses auditory and visual feedback to compare with the model and to increase patient's motivation (2, 12). In the sixth step, the SLP should use model therapy tasks for the patient, which increase the patient's self-consciousness (2, 12). The last step, the SLP has a good relationship with patients that supports the patient's anxiety and self-confident (83-84).

The treatment of voice disorders by SLPs began in the 1930s (6, 85). There were several philosophical orientations of therapy that included hygienic, symptomatic, psychogenic, etiologic, physiologic and eclectic voice therapy (6, 23, 86). The hygienic voice therapy focused on improving behaviors that could lead to trauma of the vocal folds (6, 23, 75). It was often used for the first step in many voice therapy programs (6). It was divided into 3 groups. The first group was "Don't", which included using loud voice, shouting, cheering, talking for a long time, talking over loud background noise, talking during lifting the heavy things, using the residual air volume, using hard glottal attack, using mouth breathing, throat clearing, smoking, eating less than 2-3 hours before sleeping and staying with inappropriate environment (dust, smoke, toxic gases and chemicals). The second group was "Decrease", which consisted of using high pitch, using voice during menstruation or respiratory infection, muscle tension (face, neck or shoulder) during talking, drinking (alcohol, tea or coffee) and eating (spicy, salty, sweet or sour) food. The third group was "Do", that included using an amplifier, drinking water, voice rest, sleeping and setting a good alignment for standing or sitting (2, 30-31, 53, 84-98).

Symptomatic voice therapy focused on rehabilitation of voice symptoms, which included pitch, loudness and quality by using facilitating techniques (6, 23, 85). Stemple (85) and Boone (86) proposed that the facilitating techniques included breathing exercises, establishing a new pitch, yawning-sigh technique, chewing method, chanting talk, soft glottal attack, relaxation, half-swallow boom, the pushing approach, etc. The techniques such as the breathing exercises, were emphasized to increase vital capacity and decrease using residual air that effected the approximation of the vocal folds and loudness (25, 27-28, 30-31, 81-83). The breathing exercises

were appropriately used for patients with both vocal hyperfunction and hypofunction. The established new pitch focused on the adjustment to the appropriate pitch level. This technique was useful for the patients who had low pitches due to mass at the vocal folds or who had high pitches due to faulty habit (23, 25).

According to those facilitating techniques, many studies were classified into 2 groups, depending on the nature of their functions (hyperfunction and hypofunction). The first group was appropriately used for vocal hyperfunction because it was adjusted to the optimum of vocal fold size-mass, vocal folds approximation, pitch, loudness and resonance (25) such as the yawning-sigh technique that focused on the muscle relaxation relating to voice production. It was a useful technique for the patients who had vocal hyperfunction from nodules, polyps or vocal fold thickening. It was an easy to use combination with many other facilitating approaches but rarely used alone (2, 6-7, 12, 23, 25, 28, 86-88, 98-99). The chewing method was created by Foreschels in 1924 and helped to increase the muscle relaxation in area of tongue, mandible, mouth, neck and larynx (2, 6-7, 12, 23, 25). Chanting talk aimed to increase muscle relaxation (7) and affected the approximation of the vocal folds and loudness. It was an appropriate technique for patients who had hard glottal attack and abusive behaviors. This technique was often used well with other facilitating approaches such as the chewing approach, the open mouth approach, the yawn-sigh approach, etc. (25). Soft glottal attack aimed to reduce the force of the vocal folds approximation and loudness. It was an appropriate technique for patients who had hard glottal attack and abusive behaviors (2, 7, 25, 30, 87). The muscle relaxation was to balance the muscle tone both of extrinsic and intrinsic laryngeal muscles. It was divided into two methods. The first method directly adjusted the pain muscle by using the laryngeal massage. There were several techniques of laryngeal massage such as manual circumlaryngeal therapy that was developed by Aronson in the year 1980 (100-101). The second method used the indirect technique to relax the muscle such as progressive relaxation. The progressive relaxation was created by Jacobson in the year 1962. This method used both of the relaxation and contraction of all muscles (2, 6).

On the contrary, the second group was appropriately used for vocal hypofunction. The half-swallow boom emphasized increasing the glottis closure and loudness, which were appropriate for the patients with voice disorders who had vocal

hypofunction including unilateral vocal fold paralysis, severe bowing of the vocal folds or falsetto voice (7, 12, 23, 25, 102). This technique was developed by Boone (103) and Boone & McFarlane (104). Then Hedge (65) summarized the steps of it. The aim of this method was to achieve closure of the vocal folds (7). Moreover, the pushing approach affected the approximation of the vocal folds and loudness. It was an appropriate technique for patients who had vocal hypofunction such as vocal cord paralysis or bowing of the vocal folds.

The psychogenic voice therapy focused on the identification and modification of the emotion and voice disturbances relating to the onset and maintenance of the voice problem. Sometimes the SLP should refer to the psychiatrist (6, 85).

The etiologic voice therapy focused on modifying and eliminating causes of voice disorders by using the facilitating techniques (85).

The physiologic voice therapy focused on directly modifying the vocal mechanism that involved three components. The first component was the improvement of balance among the voice production systems of respiration, phonation and resonance. The second component was the improvement of laryngeal muscles in the area of strength, balance, tone and stamina. The third component was the development of a healthy mucosal that covered the vocal folds (23). The physiologic voice therapy used the vocal function exercises technique to treat patient who had vocal hyperfunction and hypofunction. It was first described by Barnes (105) and was applied by Stemple (85).

Finally, the eclectic voice therapy was the combination of all of the voice therapy approaches because some techniques worked well for one patient, but might fail for another patient (6, 85). The SLP must be reminded that voice disorders are not only treated using voice therapy, but also can be treated using a combination of surgery or medication (2, 12). When patients imitated voice quality in the same way as a singer or celebrity, voice therapy was not the way for treatment.

2.4.1 Voice therapy prognosis

The prognosis of voice therapy was used to indicate the efficacy of voice therapy. An SLP should consider the following; Patients should be self-aware, they

should recognize their problem and be aware of their abnormal voice (12). Andrews and Summers (106) suggested that the patients who had self-awareness showed the effectiveness of voice therapy. A motivated patient should cooperate during practice. The positive prognosis of voice therapy is related to the patient's motivation during practice and the progression of voice therapy (12). Health problems of patients (psychiatric problem) or laryngeal conditions may impact or modify vocal behavior (12, 17). They must give up or eliminate any vocal abuse. The SLP should consider the severity of voice disorders. Early intervention for acute organic voice disorders offer a better prognosis than chronic organic voice disorders. Patients who had small, soft or new nodules have easier treatments than the patients who had fibrotic nodules. In the same voice pathology such as vocal nodule, the patient who had a larger size nodule might have a more severe voice disorder than another patient who had a smaller sized nodule. The SLP should consider the expectations of the patients regarding the quality of their voices after voice therapy (2, 12). Finally, a good relationship between the patient and the SLP helps make contact easier and leads to easier understanding of any problems (12).

2.4.2 Team approach

When an ENT doctor assumes there are laryngeal problems relating to voice disorders, they refer patients to the SLP for voice evaluation, who plans an appropriate voice therapy program. Moreover, some patients with voice disorders are stressed, upset or have emotional problems. Some should be referred to a psychologist (12).

2.5 Factors related to voice therapy outcome

Many research studies have demonstrated several factors affecting voice therapy outcomes are related to adherence. Thus, the present research focused on adherence factors. The World Health Organization Adherence Meeting in June 2001 focused on the patient's agreement of the clinician recommendations. They suggested ways to help ensure the patient to continue therapy for long periods of times. The concept of adherence was a better way (33). Adherence was defined as an active

collaboration between a patient and health professionals to achieve therapeutic success and the completion of the treatment (12, 20-22, 33-35, 36-40). In voice therapy programs, the precise assessment of adherence is essential for efficient treatment planning and positive health outcomes. Though there was no gold standard for assessing adherence (107-108), many literatures used questionnaires to ask the patients for their subjective ratings. This resulted in unstable or overestimated scores (109-110). Thus, the measurement of adherence should use multiple methods, including self-reporting and objective measurements.

Adherence was a multidimensional phenomenon that was divided into five sets of factors such as social and economic, the health care team and system, voice health condition, treatment and patient perception (33).

2.5.1 Social and economic factors

These factors included gender, marital status, age, educational level, health status, and socioeconomic status (ineffective social network support, unstable living conditions, long distance from the treatment center, high cost of transport, high cost of medication, etc.) (111). The literatures were documented about some social and economic factors affecting voice therapy outcome that were presented below

2.5.1.1 Gender

There were documents reviewed about gender and voice therapy (8-10, 112). Females had more voice disorders and attended more voice therapy sessions than males did. Females have less hyaluronic acid than males do. Hyaluronic acid heals wounds at the vocal folds (113-115). And females had shorter vocal folds and frequently used high pitches that cause of vocal hyperfunction (8, 113, 116). Males did not visit the doctors when they had voice quality changes (117). However several studies showed that gender does not significantly affect voice therapy outcomes. The researcher did not describe the reasons why gender was not significantly related to voice therapy outcomes. Malki et al. (40) proposed that both females and males who still had voice disorders would have their quality of life affected. Makarabhirom (2) used voice therapy to treat 30 patients with vocal nodules for 12 weeks. The patients significant improved voice quality ($p < 0.001$) and gender was not significantly related to voice therapy outcome ($p = 0.352$). Speyer et al. (19)

treated 78 patients with several laryngeal diagnostic (muscle tension dysphonia, vocal nodules, unilateral vocal fold paralysis, and etc.). After 3 months of voice therapy, the patients improved their voice quality, but the relationship between gender and voice therapy outcomes in terms of acoustic and perceptual voice assessments was not significantly related ($p > 0.042$).

2.5.1.2 Education

The patients had different knowledge of voice disorders and voice therapy. Voice disorders largely occurred in the people with poor education levels, including illiterate people (8, 118). Roy et al. (8) used a telephone to interview 1,326 participants regarding voice disorders. The participants who had college degrees had significantly less voice disorders than did the participants who had high school or lower than high school levels of education ($p < 0.0001$). Behlau et al. (119) found that teachers and non-teachers who had undergraduate levels of education had more voice disorders than did teachers and non-teachers who had graduate-level or higher than graduate levels of education. There was a rare study that directly described the relationship between the patient's education and voice therapy. For example, Makarabhirom (2) showed that the relationship between education level and voice therapy outcome was not significantly related ($p = 0.961$).

2.5.1.3 Occupation

Occupations have differences in how vocally demanding each one is. Occupational voice users have voice disorders from their occupation or voice disorders caused by working (120-121). The classification of occupational voice users was divided into five groups according to voice quality and voice load (120). The first group used a high voice quality and a high voice load. This includes actors and singers. Singers were one of the occupations where voice disorders come from using the high tone, the soft voice or using an intense vocal range that negatively affects the vocal fold through functioning excessively (122). The second group used high voice quality and moderate voice load, and included radio and television journalists. The third group used moderate voice quality and high voice load such as teachers, telephone operators, telemarketers, military, clergy and cantors. Several studies found that teachers had the highest prevalence of voice disorders (91, 96, 123-126). Verdolini and Ramig (127) collected the reports of Fritzell (124) and Titze et al (128)

about the percentage of the general population with an occupational risk of voice problems in Sweden and United State, respectively. Teachers were 5.05 % of the population that had a risk of voice problems. William (126) calculated the data from Verdolini and Ramig (127) in the role of the percentage of teachers in the population that visited the clinic. The result found that 19.6 percent visited in clinic. Roy et al. (96) compared the voice symptoms from their occupations, between teachers and non-teacher groups. The results found that teachers had significantly more voice symptoms from their occupations and was a significant barrier to work or communicate. The fourth group used moderate voice quality and moderate voice load such as bankers, business and insurance personnel, physicians, lawyers and nurses. The last group used low voice quality and high voice load such as foremen or welders. However Lancer et al. (129) interviewed 20 vocal nodule patients after surgery, voice therapy or a combination of surgery and voice therapy that related to occupation voice disorders. The occupation did not significantly influence voice disorders in both recurrence and non-recurrence in voice disorders. Makarabhirom (2) trained thirty patients with vocal nodules and found factors related to voice therapy outcomes. The results showed that the relationship between voice therapy outcome and the occupation voice user (low to moderate vocal demand groups and high vocal demand group) and voice therapy outcome was not significantly related ($p = 0.222$). Yun et al. (130) reported 175 patients with vocal polyps after vocal hygiene treatment. The study presented that occupation was not significant predictors about the improvement of vocal hygiene ($p = 0.202$).

2.5.1.4 Health status

The one of all contents to interview the patients with voice disorders was health status. Some types of voice disorders occurred from the changes in vocal fold tissue vibratory properties, due to problems such as upper respiratory tract infection, gastroesophageal reflux, allergies, asthma and hypothyroidism (131). Some neurological disorders were a cause of voice disorders that occurred from the abnormality of recurrent laryngeal nerve. Psychological disorders were a cause of voice disorders that occurred from stress, depression or anxiety (12). Lehto et al. (133) studied the relationship between patient’s background factors and hoarseness in call-center customer service advisors. There were 38 females and 10 males in this

study. The results found that the most common health problem factor in females was hormonal preparation (47%). The research documented the relationship between a patient's health status and voice therapy outcome which was rare. However, there was one research study by Makarabhirom, which showed the relationship between a patient's health problems and voice therapy outcome. (2). The results found that 53% of all patients had upper respiratory diseases such as allergy, chronic cold and sinusitis but the patient's health status was not significantly related to voice therapy outcome.

2.5.1.5 Socioeconomic status

Socioeconomic status, including ineffective social network support, unstable living conditions, long distance from the treatment center, high cost of transport, high cost of medication, etc., was not analyzed in the present study because before the patients participated in the research, they knew and understood the research conditions related to the follow-up period in the voice therapy program. Thus the patients who had to travel a long distance from the speech clinic and could not follow-up every week were not included in the study with their willingness. And the patients were not concerned with the cost of voice therapy because it was under universal coverage. In addition, Santos et al. (134) demonstrated the socioeconomic status (the distance from the speech clinic and patient's income) in the patients who had completed voice therapy and the patients who had loss following-up voice therapy that were not significantly differences ($p > 0.20$).

2.5.2 Health care team and system

There were many factors negatively affecting adherence. They included poorly developed health services, lack of knowledge and training for health care providers, overworked health care providers, lack of incentives and feedback on performance, short consultations, poor capacity of the system to educate patients and provide follow-up, an inability to establish community support and self-management capacity, lack of knowledge on adherence and ineffective interventions. The literatures documented voice therapy outcome with some health care team and system that was referring period to SLP. The referring period of time was an important factor for attendance and non-attendance in new outpatients (135). The long period of times of referral were significantly related to non-attendance of treatment (136). Within one

week (135) or beyond two months (136) of referring period influenced attendance treatment (137). The patients with voice disorders who were diagnosed by the ENT doctors and complained about their voice abnormalities were referred for voice assessment by the SLP (12). They were evaluated for voice quality either immediately or by appointment. These procedures were differences according to the individual clinical procedure. There was no research that found the relationship between the referring period to SLP and voice therapy outcome, but there was one research that showed the relationship between referring period to SLP and people who either completed or dropped out of voice therapy. Portone-Maira et al. (35) studied 197 patients with several types of voice disorders. The patients were divided into two groups --- the completers and the dropouts. The final note on every individual in the completers group included up to three reasons as to why they stopped the therapy. Every individual had one or more of these reasons in their file: The goal was achieved, the patient was satisfied with the treatment and their voice quality or they just saw no benefit from going to the next session. The individuals in the dropouts group also had notes in their files. One or both of these statements was included in their file: They had a plan to attend another session or they just failed to follow up with the therapist. The results found that the weeks from referral to voice evaluation was the significant variable to predict therapy completion ($p = 0.04$). Mean of the days from referral to voice evaluation in the completers and dropouts group were 20.1 and 31.8 days respectively. The days from referral to voice evaluation was significantly different between the completers group and the dropouts group ($p < 0.05$).

2.5.3 Voice health condition

Condition-related factors referred to the illness of the patients facing. The important adherence factors related to voice therapy outcome such as the severity of symptoms or disease, level of disability (physical, psychological, social and vocational) and rate of progression. The severity of impaction on adherence depended on patients' risk perception, the importance of follow-up and the priority placed on adherence. Some example of voice therapy outcome and voice health condition related factors are.

2.5.3.1 Duration of voice disorders

In general, the patients who had a gradual change of voice problem sought for treatment less than the patients who had a sudden voice problem. Colton et al. (12) reported about their experiences that a period of months had elapsed from the onset of voice disorders to voice assessment. Although there were studies that showed the duration of voice disorders was not significantly related to the patient's perception of voice disorders and voice therapy outcome. Behrman et al. (36) studied 100 patients with several benign vocal fold lesions and found there was a mean duration of 9 months of having the voice disorders before being assessed. The results found that the duration of the voice disorders did not significantly affect the patient's perception of voice disorders. The patients who had a long duration of voice disorders might have habituation and decreased sensitivity of dysphonia, or to compensate their ability of voice production. Yun et al. (130) reported the 175 patients who had vocal polyp with onset of 5.5 ± 8.2 months of voice disorders showed that the relationship between duration of voice disorders and vocal hygiene therapy outcome was not significantly related ($p = 0.965$).

2.5.3.2 Type of voice disorders

Speyer et al. (19) presented the relationship between diagnostic categories and voice therapy outcome in 78 patients with several types of voice disorders. The results found that the patients with slight vocal fold abnormalities significantly improved their voice quality in assessment of both objective (jitter, shimmer and noise to harmonic ratio) and perceptual (grade and roughness) voice qualities. For the patients who had unilateral vocal fold paralysis, they had slightly improved voice quality for perceptual voice assessment. However, there were the studies reported that the types of voice disorders did not relate to voice measurement and voice therapy outcome (47, 138-139). For example Schindler et al. (47) divided 80 voice disorders patients into 4 groups. They were functional dysphonia, unilateral vocal fold paralysis, structural dysphonia and nodules. They used an objective voice measurement in terms of acoustic assessment i.e. maximum phonation time, fundamental frequency, jitter, shimmer and noise-to-harmonic ratio. The results presented that the types of voice disorders did not significantly influence objective testing because the patients might have the same severity of voice disorder.

Speyer et al. (138) treated 62 patients with muscle tension dysphonia, vocal fold edema, vocal fold nodules, vocal fold polyp, vocal fold paralysis and others voice disorders (slight and severe vocal fold abnormalities groups) by voice therapy over 3 months. The results found no significant differences in therapy. Their effects were analyzed in the diagnostic groups. The reasons that supported these results were unclear regarding the diagnostic groups and the small number of patients in each group. Wingate et al. (139) studied 18 patients with voice disorders and divided them into 2 groups (lesion and non-lesion groups). After 6 sessions over 3 weeks, for voice therapy, and 5 weeks for expiratory muscle strength training (EMST), the patients were measured for therapy outcomes by perceptual, pulmonary, aerodynamic, and acoustic measurements. The results showed that no significant differences were found between lesion and non-lesion groups, except aerodynamic measurement regarding subglottal pressure at the loud intensity level and they did not discuss these results.

2.5.3.3 Severity of voice disorders

The severity of voice disorders were individual differences. The duration of the recovery period of vocal tissues from a large lesion might be longer than the recovery period from a small lesion. The recovery periods vary across people. Hapner et al. (32) studied the voice therapy dropout in 147 patients with voice disorders. The results found that the completion group had a mean overall of severity CAPE-V scores that were 48.69, and the mean of the dropout group was 49.41. There was no significant difference between the severity of voice disorders in the completion group and the dropout group ($p > 0.05$). The severity of voice disorders was not significantly associated with voice therapy completion because the participants came from differences institutions (2 institutions) and had different criteria for assessment. Santos et al. (134) investigated the adherence of 135 dysphonic teachers in speech therapy. The patients were divided into two groups. They were the discharged group and the abandonment group. The results showed that the discharged group had normal voice 6.7%, mild voice disorders 66.3%, and moderate to profound voice disorders 27.0%. The abandonment group had normal voice 6.5%, mild voice disorders 60.9% and moderate to profound voice disorders 32.6%. The severity of voice disorders was not significantly associated with discharge and abandonment groups ($p = 0.775$) because the severity of voice disorders did not influent to the patient's motivation to

continue therapy. There were two researches that showed the relationship between the severity of voice disorders and voice therapy outcome. Makarabhirom (2) presented that the relationship between the severity of voice disorders and voice therapy outcomes in 30 patients with vocal nodule was significantly associated ($p = 0.030$). Speyer et al. (140) treated 77 chronic dysphonia. The results showed that after voice therapy, 39 patients had a significant decrease in severity of voice disorders. The correlation between the severity of voice disorders and total scores of VHI, which Spearman's correlation coefficients was 0.58, but it did not show a significant correlation.

2.5.3.4 Voice usage

The amount of voice usage was potentially linked to a high risk of voice disorders. Vocal fatigue occurs when a person does not get enough vocal resting time for vocal fold tissue recovery (91, 112, 120, 122, 125, 129, 141-142). If they left untreated for three weeks, hoarseness from vocal fatigue may become persistent hoarseness (143). There were several studies that presented the relationship between voice usage and voice disorders, but they did not directly present the relationship between voice usage and voice therapy outcome. For example, Rantala et al. (144) studied three female teachers that had voice usage rates of about 3-5 hours per day, with 35 minutes duration of teaching. During teaching, their vocal folds vibrated between 15% and 40% of the time. When their vocal folds vibrated, collisions between the vocal fold mucosa occurred. When a person does not get enough rest for their vocal folds tissue to recover, there may be repeated injuries (145). Smith et al. (146) send the questionnaire to 554 teachers by mail to interview about voice problems. The teachers taught several subjects such as math, computer science, social sciences, physical education, English or foreign languages, special education, etc. The average voice usage was 6.3 hours per day and almost 2 of those they talked over loud background noise. Teaching physical education presented a significant increase in the probability of having a voice disorder related to voice usage. This increase risk is caused by yelling over long distances or for long durations without using an amplification. Kankare et al. (147) examined 119 female kindergarten teachers that had 7.46 ± 0.3 hours of teaching in their work day. The results found that the total speaking time during the work day moderately affected their work.

Carroll et al. (148) studies seven classical singers, and what role vocal fatigue had on them during their intensive practice periods. The results found that they perceived a higher discomfort inside and outside the larynx on the day, and it stayed the same for the following 24-72 hours. After they had at least 48 hours of vocal rest, they perceived an improvement. However, there were documents that presented different results. For example, Da Costa et al. (149) mailed questionnaires about demographic information, personal voice health, and barriers to care to 237 teachers. Most teachers (55.9%) had 4-5 teaching of hours per day. The teaching hours per day were not significantly related to seeking treatment for voice disorders ($p > 0.05$). Côrtes Gama et al. (150) studied before and after voice usage in 73 professional voice users who were using their voices for 2.5 hours per day. Results were not significantly different in the acoustic, perceptual, and patient's self-rating.

2.5.3.5 Vocal abuse behaviors

Vocal misuse might become vocal abuse, leading to tissue changes that cause voice disorders. Vocal abuse refers to vigorous overuse of the voice. This occurs during many types of activities, including excessive or prolonged loudness, excessive singing, loud talking, shouting, cheering, straining, excessive use during swelling, inflammation or other tissue changes, excessive coughing and throat clearing, screaming or noise making, sport or exercise enthusiasm. Including speaking with residual air, and speaking in loud background noise (1, 12, 151). Behlau et al. (119) presented that 968 of 3,265 patients with voice disorders had frequent throat clearing experience. Kankare et al. (147) showed that loud voice used by the teachers moderately affected their work. Ubillos et al. (152) documented that the relationship between raising and forcing the voice significantly related to phoniatric treatments ($p = 0.045$). Broaddus-Lawrence et al. (95) investigated vocally abusive behaviors including verbal arguing, coughing, throat clearing, talking in noisy places, talking in smoky places, coaching and waiting tables. These patients, who were treated by vocal hygiene education, were not significantly different before therapy. Makarabirom (2) compared the frequency of patient's vocal abuse behaviors before and after voice therapy. The results found that after voice therapy the patient's vocal abuse behaviors were significant decreased ($p < 0.05$). The relationship between the patient's vocal abuse behaviors and efficacy of voice therapy did not relate significantly ($p = 0.256$).

2.5.4 Treatment

There were many therapy-related factors that affected adherence, especially the complexity of the medical treatment, the duration of treatment, any previous treatment failures, any frequent changes in treatment, the immediacy of beneficial effects, side-effects and the availability of medical support to deal with them. The presented research focused on accuracy of voice therapy at speech clinic and dosage of voice therapy at home.

2.5.4.1 Accuracy of voice therapy at speech clinic

Colton et al. (12) documented the guideline of voice therapy that the early stage of voice therapy program SLP should start with easy task because the patients were proud their goal achievement and increased motivation to practice with accuracy way to pass next goal achievement. Makarabhirom (2) treated 30 patients who had vocal nodules with voice therapy for all 12 weeks. The results found that the accuracy of voice therapy significantly related to the efficacy of voice therapy outcome ($p = 0.031$). The patients would perform those appropriated techniques matched with their nature of voice disorders as mentioned in 2.4 voice disorders treatment.

2.5.4.2 Progression of voice therapy at speech clinic

Colton et al. (12) stated the positive prognosis of voice therapy was associated with positive progression of voice therapy when the patients achieved from an easy step of voice therapy approach with an accuracy method, SLPs should further treat them with the advance step of voice therapy approach that approximately used in daily life living. At the present time, there still is no study to find the relationship between the factor of the progression of voice therapy at speech clinic and voice therapy outcome.

2.5.4.2 Dosage of voice therapy at home

Wenke et al. (153) studied 16 patients with functional voice disorders. The patients were organized into two groups. They were the intensive group and the standard treatment group. The results found that high satisfaction and significant improvements on VHI scores were found after intensive treatment. The mean total duration of homework completed for the intensive and standard treatment groups were 3.03 and 9.15 hours respectively. That was a significant difference

between the groups (p = 0.042). The mean total duration homework for standard treatment was longer than the intensive treatment because the standard treatment had prepractices to increase the knowledge of both what the task was, and how to perform it through conscious and focused attention of movement. The mean total proportion of homework completed per week in the intensive and standard treatment groups were 1.51 and 1.23 hours per week, respectively. There was not a significant difference between the groups (p = 0.606). This study did not analyze the relationship between mean total duration homework completed and voice therapy outcome. In addition, Makarabhirom (2) showed that sixteen patients practiced 1-2 voice therapy techniques, 1-2 times at home. Fourteen patients practiced 2-3 voice therapy techniques, 2-3 times at home. The total duration was 12 weeks. The relationship between the quantity of voice therapy approach with the number of times practiced did not significantly relate to the efficacy of voice therapy outcome (p = 0.282).

2.5.5 Patient perception

Patient perception refers to a patient's resources, knowledge, attitudes, beliefs, perceptions and expectations. There are several literatures that indirectly explained the patient's perception. The SLP encouraged the patients on how the voice sounds and feels. These procedures helped the patients to increase the self-awareness and maintain the best voice (12). If the patients had self-awareness, they would have a good prognosis and achieve the voice therapy (31). For example, the patients who had a belief in, and motivation for treatment, this influenced them to continue treatment. It improved their self-management skill and adherence. The present research focused on patient's satisfaction to voice therapy service and patient's attitude to voice therapy.

2.5.5.1 Patient's satisfaction to voice therapy service

When the SLP understood the patients problems and felt competence to handle it, the patients had a good satisfaction to their voice therapy service especially to the SLP. According to this reason the patients might present a good relationship with the SLP (12). Moreover the WHO suggested that a good patient-provider relationship might improve adherence of therapy (33). The prognosis of voice therapy is related to the relationship between patients and their SLPs. A good relationship between patients and their SLP might foster a positive prognosis of voice

therapy because the SLPs helped to decrease patient's anxiety or depression, and help increase a patient's motivation for treatment (12). As the results that the patients had a good satisfaction to voice therapy service, which brought them to continue their treatment with voice therapy. At the present time, there still is no study to find the correlation between the factor of relationship between patients and their SLPs, and voice therapy outcome.

2.5.5.2 Patient's attitude to voice therapy

The WHO proposed that the patients who had a negative attitude, a disbelief in the efficacy of the treatment or a low motivation had a low adherence to therapy (33). The positive prognosis of voice therapy related to a patient's good attitude. Wenke et al. (153) presented that high satisfaction and significant improvements on VHI scores were found after intensive voice therapy, but the satisfaction was not different between the intensive group and the standard voice therapy group. The patients from the intensive voice therapy group commented that they enjoyed the intensive treatment and did not identify factors that were similar in the treatment. At the present time, there were not any studies to find the correlation between a patient's attitude to voice therapy and voice therapy outcome.

CHAPTER III
MATERIALS AND METHODS

The instruments and procedures for measuring voice therapy outcome and quality of life were included:

3.1 Participants

The participants were adult-aged patients with voice disorders who visited the speech clinic at Ramathibodi Hospital.

3.1.1 Characteristic of the participants

The participants in this study had abnormal voice quality. The participants were older than 18 years old. The hearing and structure of their oral cavities were normal. The participants did the voice handicap index, Thai language version, (VHI-TH) by themselves. The participants never have been treated with voice therapy before entering the project, and attended at least 80% of their voice therapy program's sessions.

3.1.2 Sample size

This study aims to assess the factors affecting voice therapy outcome using the data from the pre and post voice therapy program. The calculation of the sample size was done using the Paired sample mean formula (154). The mean standard deviation of total VHI scores before and after voice therapy came from Bowie et al. (51). It was 22.135 points. The review literature of the researches were related to the mean VHI scores in normal subjects. It was found that the range of mean VHI scores were 1.12 to 10.50 points (21, 37-41, 44, 48, 52, 155-157). The average of total VHI scores in the normal group was used in calculations in this study, and was 10.40 points (39). The level of significance and power was set at 5% and 80% respectively.

Formula: $n > \frac{\sigma_D^2\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2}{(\mu_1 - \mu_0)^2}$

$n > 35.56 \sim 36$

The sample size is at least 36 people

3.2 Instrumentations

Some devices used in this study were the questionnaires and the recording forms for voice evaluation

3.2.1 Instrument details

3.2.1.1 The demographic and medical history questionnaire

The questionnaire format by the Thai Speech-Language and Hearing Association (151), was adapted and used to interview the patients in this study. (See Appendix A) The details included general data, the history of the disorders, the behavioral voice used and other health conditions.

3.2.1.2 The voice handicap index recording form

The VHI-TH was translated and adapted by Jarujinda and Suwanwarangkool (22). It has a high reliability ($\propto = 0.96$) and validity (IOC > 0.5). In this research, the researcher adjusted the items by sorting the questions according to the original VHI (See Appendix B). There were 30 items with 3 subscales in the VHI-TH (functional; F-VHI-TH, physical; P-VHI-TH, and emotional; E-VHI-TH), each containing 10 items. The functional subscale included statements that described the impact of a person's voice disorder on their daily activities. The physical subscale included statements representing self-perceptions of laryngeal discomfort and voice output characteristics, including whether the voice was pitched either too low or too high. The emotional subscale consisted of statements representing a patient's affective responses to a voice disorder. The rating scale was a five-point equal scale, scored from zero to four: 0 = Never, 1 = Almost never, 2 = Sometimes, 3 = Almost always, 4 = Always. The total score was 120 points. The higher scores meant severe impact quality of life.

3.2.1.3 The perceptual voice evaluation and recording form

The criteria for evaluation employed the GIRBAS scale: Grade of severity (G) = the general degree of impairment, Instability (I) = fluctuation of voice quality over time, Roughness (R) = the voice quality related to the impression of irregular pulses or random fluctuations of the glottal pulses, Breathiness (B) = the voice quality related to the audible turbulent noise generated at the glottis, Asthenia (A) = auditory impression of weakness or powerlessness, hypofunctional voicing and Strain (S) = excessive effort or tension in the larynx and also probably in the respiratory system, hyperfunctional voicing. The rating was on a 4 point scale: 0 = normal, 1 = mild, 2 = moderate, and 3 = severe (15). Each subscale scores (I, R, B, A and S) were grouped and converted to G with 4 point scale rating (0 = normal, 1-5 = mild, 6-10 = moderate, and 11-15 = severe) (See Appendix C). The higher scores meant more severe voice disorders.

3.2.1.4 The objective voice evaluation and recording form

The acoustic parameters were fundamental frequency, jitter, shimmer and normalized noise energy. The software analyzed the acoustic parameters in terms of the aspects of voice quality including harshness, breathiness and hoarse voice (158). Harsh voice is aperiodic noise or irregular vocal fold vibration (159). Breathy voice is the perception of audible air that escapes during phonation. Hoarse voice is noticeably aberrant in its lack of clarity, its increased noisiness, and its discordance (17). The rating was on a 4 point scale: 0 = normal, 1 = mild, 2 = moderate, and 3 = severe. After that the scores of harshness, breathiness and hoarse voice were grouped and were converted to grade of voice quality. The rating was on a 4 point scale: 0 = normal, 1-3 = mild, 4-6 = moderate, and 7-9 = severe (See Appendix D). The higher scores meant more severe voice disorders.

3.2.1.5 The satisfaction of voice therapy recording form

The recording from for the participant’s satisfaction of voice therapy, including the relationship between patients and SLP and patient’s attitude to voice therapy. The rating was on a 5 point scale: 1 = very poor, 2 = moderately poor, 3 = slightly poor, 4 = good and 5 = very good (See Appendix E)

3.2.1.6 The voice therapy recording form

The recording form for the voice therapy included the date, the number of the session, the voice therapy approach, accuracy and progression of voice therapy in the session, any problems and solving in the session (See Appendix F). The calculation of an accuracy of the voice therapy, the researcher collected the scores individually according to voice therapy approach (2, 6-7, 12, 23, 25, 28, 30, 86-88, 98-99, 100-104) such as yawn-sigh technique for vocal fold hyperfunction or pushing approach for vocal folds hypofunction (See Appendix G). Their performance task score as 0 = wrong, 1 = right. The researcher calculated the total scores in the percentages of an accuracy of voice therapy. For the calculation of the progression of the voice therapy in each patient, SLP weighted the scores according to the methods of voice therapy approach (2, 6-7, 12, 23, 25, 28, 30, 86-88, 98-99, 100-104). Based on the hierarchic level of tasks, when the patients adapted the voice therapy approach in vowel prolongation level (i.e. /a:/, /u:/, /i:/, etc.) they received 1 score, word or phrase (i.e. ball, eat, counting number, etc.) = 2 scores and sentence or connected speech (i.e. My name is Paul., I eat soup in the morning., This is a table., etc.) = 3 scores (See Appendix H). The researcher collected and calculated the total scores into the percentages. The formulation of the percentage of accuracy and progression of voice therapy were showed in Appendix F.

3.3 Data collection procedures

This study began after approval from The Ethical Committee of the Ramathibodi Hospital. All new 36 participants signed a consent form. The patients with voice disorders were diagnosed either by an otolaryngologist or a neurologist. The SLP informed the participant of the purposes and explained the procedures of this study. There were ten total voice therapy sessions. There was a thirty minute session each week. Patients must attend at least 80% of these sessions. The SLP, who was the researcher, treated the patients with voice therapy in the speech clinic at Ramathibodi Hospital. The criteria for discharging out of the voice therapy program were as follows (one or both of the criteria could be satisfied): the voice therapy goal was achieved, or the patients indicated they were satisfied with their voice quality.

The patients were interviewed about their demographic data and medical history. They received the VHI-TH to collect the data baseline. They completed it by themselves with no time limitation. The SLP gave the instructions to the patients "These are statements that many people have used to describe their voices and the effects of their voices on their lives. Check the response that indicates how frequent you have the same experience." When the patients hesitated to answer the questionnaires, the SLP clarified the questions.

The patients received voice quality evaluation to collect the data baseline. For the perceptual voice evaluation, the patients prolonged vowel /a:/ three times and connected speech (160) (See Appendix I) with a digital sound recorder, via a microphone, with comfortable levels of loudness and pitch. The distances between patient's mouth and microphone were between five and ten centimeters. For the objective voice evaluation, vocal assessment software by DRS was used. The patients prolonged the vowel /a:/, via the microphone, with comfortable levels of loudness and pitch, for as long as possible but not less than three seconds. The distance between the patient's mouth and the microphone was between five and ten centimeters.

The speech samples from the perceptual voice evaluations were stored in a USB Mass Storage Device and were evaluated by three professional SLPs, via the digital sound player. Before perceptual voice evaluation, the three professional SLPs adjusted the inter-reliability by evaluating voice samples from 5 patients. But, the researcher did not include these samples in this research until they approved the criteria.

The patients received voice therapy. The first step the patients received the indirect voice therapy such as voice rest, eliminated vocal abuse, water intaking, etc. Next, they received the direct voice therapy based on their diagnosis such as breathing exercise, muscle relaxation, yawn-sigh technique, vocal function exercise, pushing exercise, etc. All patients received 10 sessions of voice therapy. They obtained 30 minutes/session/week. The researcher weighted and calculated the total scores of the accuracy and progression of voice therapy every session into percentages.

For the follow up period, the SLP assessed the patients' voice quality, quality of life and the satisfaction of the patient's satisfaction to voice therapy service

and patient's attitude to voice therapy in the 10th session. The data collection procedures was showed in Figure 3.1.

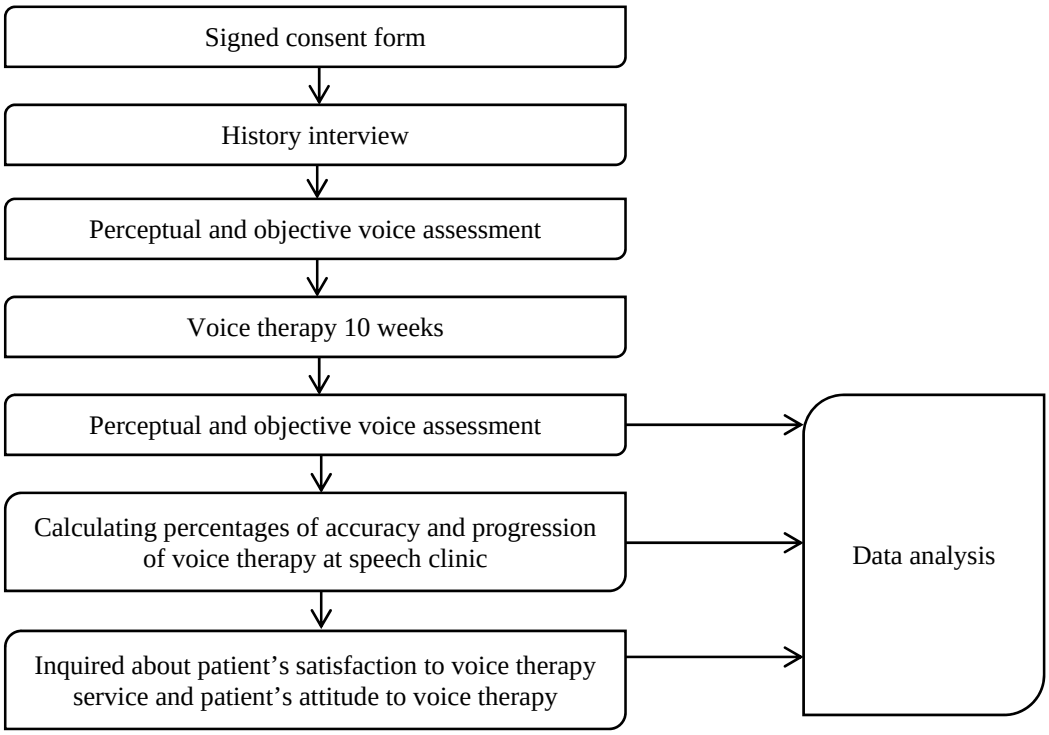

Figure 3.1 Flowchart represent the data collection procedures of the study

3.4 Data Analysis

The statistic for analyzing data computed by statistical package IBM SPSS Statistics 22.

3.4.1 The characteristics of the data were described using descriptive statistics.

3.4.2 Factors affecting voice therapy outcome in adults with voice disorders were found using the Chi-square test or Fisher's Exact test.

3.4.3 The direct and indirect factors affecting the quality of life in adults with voice disorders were found using the Independent t-test or Mann-Whitney test.

3.4.4 The level of significance was set at 0.05.

CHAPTER IV
RESULTS

The results of this research are presented in 3 sections:

4.1 The descriptions of the participant's characters

4.2 Measurements of voice therapy outcomes

4.3 The relationship between the adherence factors related to voice therapy outcome

4.1 The descriptions of the participant's characters

This research consisted of 36 participants. They were 25 females and 11 males (69.4% and 30.6% respectively) with voice disorders from the speech clinic at Ramathibodi Hospital from March to November 2014. The mean age of the participants was 51.31 years (range 18-76 years). The participant's variables were classified according to adherence factors related to voice therapy outcome. The descriptions of the participant's characters were presented below and showed in Table 4.1.

4.1.1 Social and economic factors

The participants consisted of 25 females and 11 males (69.4% and 30.6% respectively). Twenty-nine participants (80.6%) had an undergraduate or higher university level degrees. Twenty-two participants (61.1%) were occupational voice users (teacher, telephone operator, actor and etc.). The participants indicated there was some damage to their health systems, including, the respiratory, neurological, endocrine, psychological, digestive and etc. It was found that 29 participants (80.6%) had anywhere from 1 to 6 different diseases they were fighting. (see Table 4.1)

4.1.2 Health care team and system

During the referring period to the SLP, 26 participants (72.2%) waited for consultations with the SLP. The mean referring period to the SLP was 7.12 days (range 1-26 days) (see Table 4.1).

4.1.3 Voice health condition

Nineteen participants (52.8%) had a duration of voice disorders lasting longer than 1 year (2-20 years). Twenty-two participants (61.1%) had organic voice disorders. Before voice therapy, the severity of the patients' voice disorders was assessed. Using perceptual voice assessment, it was found that 19 participants (52.8%) had a mild degree, and 15 participants (41.7%) had a moderate degree of voice disorder for objective voice assessment. Their doses of voice usage ranged from 0-12 hours per day. Twenty-eight participants (77.8%) used their voice for 0-6 hours per day. Vocal abuse behaviors that were collected from the demographic and medical history questionnaire (appendix A) such as throat clearing or cough, speaking in loud background noise, vocal strain, being talkative, hard glottal attack, singing, speaking with neck shrink, shouting, using residual air to speak and imitating of the sound, were found in 19 participants (52.8%), who displayed from 1-5 behaviors. (see Table 4.1)

4.1.4 Treatment

Regarding with the accuracy of voice therapy at speech clinic, 25 participants (69.4%) obtained 60-100%. Twenty four participants (66.7%) had good progression of voice therapy at the level 60-100%. For the dosage of voice therapy at home, 19 participants (52.8%) practiced more than 4 days per week, 32 participants (88.9%) drilled between 1 to 10 rounds per day, and 26 participants (72.2%) drilled between 1 and 10 times for each round. (see Table 4.1) The researcher organized the patients' patterns of voice therapy at home. They were divided into five patterns which varied by the number of practices. The researcher defined one cycle of breathing, the inspiration and the expiration, to be one time. The researcher defined the range of scores of dosage of voice therapy at home to be an ordinal number. For example, the range of scores of voice therapy for each round were as follows: 1 score for doing 1-10 breathing exercises per round and 2 scores for doing more than 10 exercises per round.

The range of scores regarding the frequency of doing voice therapy rounds per day were as follows: 1 score for doing 1-10 rounds per day and 2 scores for doing more than 10 rounds per day. The scores of periods of voice therapy per week were as follows: 1 score for practicing 1-4 days a week and 2 scores for practicing more than 4 days a week. Then, they were grouped and converted from number of scores into 2 patterns (low dosages and high dosages which 3-4 scores were low dosage and 5-6 scores were high dosage). Seven participants (19.4%) had high dose patterns and 29 participants (80.6%) had low dose patterns. (see Table 4.2)

4.1.5 Patient perception

The data were collected from the satisfaction of voice therapy recording form (appendix E). Thirty-three participants (91.7%) had a very good satisfaction to voice therapy service. Thirty-one participants (86.1%) had a very good attitude towards voice therapy. (see Table 4.1)

Table 4.1 Characteristics of the participants presented by the group of adherence factors related to voice therapy outcome

Characteristics		N=36	%
1. Social and economic factors			
Gender	Female	25	69.4
	Male	11	30.6
Education	< Undergraduate level	7	19.4
	Undergraduate or graduate level	29	80.6
Occupational voice disorders	Occupational voice users	22	61.1
	Nonoccupational voice users	14	38.9
Health status	Present (1-6 diseases)	29	80.6
	Absent	7	19.4
2. Health care team and system			
Referring period to SLP	Immediate	10	27.8
	Waiting 1-26 days (Mean 7.12 days)	26	72.2

Table 4.1 Characteristics of the participants presented by the group of adherence factors related to voice therapy outcome (cont.)

Characteristics		N=36	%
3. Voice health condition			
Duration of voice disorders	≤ 1 year	17	47.2
	> 1 year	19	52.8
Type of voice disorders	Organic	22	61.1
	Nonorganic	14	38.9
Severity of voice disorders			
Perceptual voice assessment	Normal	2	5.6
	Mild	19	52.7
	Moderate	13	36.1
	Severe	2	5.6
Objective voice assessment	Normal	3	8.3
	Mild	8	22.2
	Moderate	15	41.7
	Severe	10	27.8
Voice usage	0-6 hours/day	28	77.8
	> 6 hours/day	8	22.2
Vocal abuse behaviors	1-5 behaviors	19	52.8
	> 5 behaviors	17	47.2
4.Treatment			
Accuracy of voice therapy at speech clinic	0-59%	11	30.6
	60-100%	25	69.4
Progression of voice therapy at speech clinic	0-59%	12	33.3
	60-100%	24	66.7

Table 4.1 Characteristics of the participants presented by the group of adherence factors related to voice therapy outcome (cont.)

Characteristics		N=36	%
4.Treatment (cont.)			
Dosage of voice therapy at home			
Days per week	1-4 days	17	47.2
	> 4 days	19	52.8
Rounds per day	1-10 rounds	32	88.9
	> 10 rounds	4	11.1
Times each round	1-10 times	26	72.2
	> 10 times	10	27.8
Dosage	Low	29	80.6
	High	7	19.4
5. Patient perception			
Patient's satisfaction to voice therapy service	Very poor	-	-
	Moderately poor	-	-
	Slightly poor	-	-
	Good	3	8.3
	Very good	33	91.7
Patient's attitude to voice therapy	Very poor	-	-
	Moderately poor	-	-
	Slightly poor	-	-
	Good	5	13.9
	Very good	31	86.1

Table 4.2 The patterns and dosage of voice therapy at home

Therapy patterns	Patient's voice therapy at home						
	Days per week	Rounds per day	Times each round	Total scores	Dosage patterns		
					Dosage	N	%
1	1-4 days	1-10 rounds	1-10 times	3	Low	14	38.9
2	1-4 days	1-10 rounds	>10 times	4	Low	3	8.3
3	>4 days	1-10 rounds	1-10 times	4	Low	12	33.4
4	>4 days	1-10 rounds	>10 times	5	High	3	8.3
5	>4 days	>10 rounds	>10 times	6	High	4	11.1

4.2 Measurements of voice therapy outcomes

The measurements of voice therapy outcomes were divided into 3 sections, the perceptual assessment of voice quality, the objective assessment of voice quality, and their quality of lives.

4.2.1 Perceptual assessment of voice quality

For the results of the perceptual voice assessment before voice therapy, 19 participants (52.8%) had poor voice quality at a mild degree. After voice therapy, 14 participants (38.9%) had normal voice quality. The comparison of voice quality before and after voice therapy showed significant differences ($z = -3.891$, $p < 0.001$). (see Table 4.3)

4.2.2 Objective assessment of voice quality

At the objective voice assessment before voice therapy, 15 participants (41.7%) had poor voice quality at a moderate degree. After voice therapy, 17 participants (47.2%) had normal voice quality. The comparison of voice quality before and after voice therapy showed significant differences ($z = -4.399$, $p < 0.001$). The results of perceptual and objective voice assessments after voice therapy showed significant correlation using the Spearman's rho test ($R_s = 0.527$, $p = 0.001$). (see Table 4.3)

Table 4.3 Voice therapy outcomes from perceptual and objective voice assessment

Assessment	Voice therapy	Voice quality N (%)				Wilcoxon Signed Ranks Test, Z	p-value	Spearman's rho Test, r_s	p-value
		Good voice	Poor voice						
			Mild	Moderate	Severe				
Perceptual	Pre	2 (5.6)	19 (52.8)	13 (36.1)	2 (5.6)	-3.891	<0.001	0.527	0.001
	Post	14 (38.9)	16 (44.4)	6 (16.7)	-				
Objective	Pre	3 (8.3)	8 (22.2)	15 (41.7)	10 (27.8)	-4.399	<0.001		
	Post	17 (47.2)	9 (25.0)	9 (25.0)	1 (2.8)				

4.2.3 Quality of life measurement

In the beginning, the means data from the total (T-VHI-TH), functional (F-VHI-TH), physical (P-VHI-TH) and the emotional (E-VHI-TH) scores from the Voice Handicap Index version Thai language was tested for normal distribution using the Kolmogorov-Smirnove test. The results found that they were in a normal distribution except the mean data of E-VHI-TH was not in a normal distribution. These mean of T-VHI-TH, F-VHI-TH and P-VHI-TH were compared using the Paired t-test, but E-VHI-TH was compared using the Wilcoxon Signed Ranks test.

The mean and standard deviation (SD) before voice therapy T-VHI-TH score was 43.6 ± 20.8 scores. The range of the T-VHI-TH score was 12-89 scores. The mean and SD of F-VHI-TH, P-VHI-TH and E-VHI-TH score were 13.7 ± 7.4, 19.5 ± 7.2 and 10.5 ± 8.9 scores respectively. After voice therapy, the mean and SD of T-VHI-TH score was 20.3 ± 16.2 scores. The range of the T-VHI-TH score was 0-65 scores. The mean and SD of F-VHI-TH, P-VHI-TH and E-VHI-TH score were 6.2 ± 5.3, 9.4 ± 6.2 and 4.8 ± 5.9 respectively. The comparison of T-VHI-TH score before and after voice therapy were significantly different ($t = 8.868$, $df = 35$, $p < 0.001$). Including the comparison of subscales of (F-VHI-TH, P-VHI-TH and E-VHI-TH) scores before and after voice therapy were significantly different ($t = 7.134$, $df = 35$, $p < 0.001$; $t = 7.933$, $df = 35$, $p < 0.001$; $z = -4.789$, $p < 0.001$ respectively). (see Table 4.4)

Table 4.4 Voice therapy outcome from VHI-TH

Scores	Voice therapy	Mean±SD (points)	Range	Paired t-test, t	df	p-value
T-VHI-TH	Pre	43.6 ± 20.8	12 – 89	8.868	35	< 0.001
	Post	20.3 ± 16.2	0 – 65			
F-VHI-TH	Pre	13.7 ± 7.4	1 – 30	7.134	35	< 0.001
	Post	6.2 ± 5.3	0 – 19			
P-VHI-TH	Pre	19.5 ± 7.2	8 – 36	7.933	35	< 0.001
	Post	9.4 ± 6.2	0 – 23			
E-VHI-TH	Pre	10.5 ± 8.9	1 – 33	-4.789*	-	< 0.001
	Post	4.8 ± 5.9	0 – 23			

* Wilcoxon Signed Ranks Test

4.3 The relationship between the adherence factors related to voice therapy outcome

All factors were analyzed according to adherence of voice therapy. Resulting to 2x2 table many factors had the frequency of the variables less than 5. The researcher grouped those variables into 2 groups, including the severity of voice disorders (a group of normal to mild and a group of moderate to severe), the patient's satisfaction to voice therapy service (good and very good group) and patients' attitudes to voice therapy (good and very good group). There are 2 sections of these results below:

4.3.1 Factors affecting voice therapy outcome by objective voice assessment

After voice therapy, many participants improved their voice quality. Only one participant still had a severe voice disorder. For an accurate analysis, the researcher divided voice quality into two groups: good voice quality and poor voice quality. The good voice quality group referred normal grades of voice quality after voice therapy. The poor voice quality group referred mild to severe grade of voice quality after voice therapy. These results found that the adherence factors in the group

of voice health condition (severity of voice disorders, voice usage, accuracy and progression of voice therapy at speech clinic) were significantly affected to voice quality after the voice therapy program (x^2 = 7.607; 5.360; 6.743; p = 0.006; 0.016; 0.021; 0.009 respectively). (see Table 4.5)

Table 4.5 The relationship between voice quality after the voice therapy program and factors affecting voice therapy outcome achieving from objective voice assessment

Factors	Voice therapy outcome		Chi-square, x^2	df	p-value
	Good voice	Poor voice			
1. Social and economic factors					
Gender					
Female	14	11	2.529	1	0.112
Male	3	8			
Education					
<Undergraduate level	2	5	*	-	0.408
Undergraduate or graduate level	15	14			
Occupational voice disorders					
Occupational voice user	10	12	0.071	1	0.790
Nonoccpational voice user	7	7			
Health status					
Present	13	16	*	-	0.684
Absent	4	3			
2. Health care team and system					
Referring period to SLP					
Immediate	2	8	*	-	0.065
Waiting	15	11			
3. Voice health condition					
Duration of voice disorders					
≤1 year	8	9	0.000	1	0.985
> 1 year	9	10			
Type of voice disorders					
Organic	8	14	2.676	1	0.102
Nonorganic	9	5			

*Fisher's Exact Test

Table 4.5 The relationship between voice quality after the voice therapy program and factors affecting voice therapy outcome achieving from objective voice assessment (cont.)

Factors	Voice therapy outcome (n)		Chi-square, x^2	df	p-value
	Good voice	Poor voice			
3. Voice health condition					
Severity of voice disorders					
Normal-Mild	9	2	7.607	1	0.006
Moderate-Severe	8	17			
Voice usage					
0-6 hours/day	10	18	*	-	0.016
>6 hours/day	7	1			
Vocal abuse behavior					
1-5 behaviors	8	11	0.423	1	0.516
>5 behaviors	9	8			
4. Treatment					
Accuracy of voice therapy at speech clinic					
0-59%	2	9	5.360	1	0.021
60-100%	15	10			
Progression of voice therapy at speech clinic					
0-59%	2	11	6.743	1	0.009
60-100%	15	8			
Dosage of voice therapy at home					
Days per week					
1-4 days	10	7	1.739	1	0.187
>4 days	7	12			
Rounds per day					
1-10 rounds	16	16	*	-	0.605
>10 rounds	1	3			
Times each round					
1-10 times	12	14	*	-	1.000
>10 times	5	5			
Dosage					
Low	14	15	*	-	1.000
High	3	4			

*Fisher's Exact Test

Table 4.5 The relationship between voice quality after the voice therapy program and factors affecting voice therapy outcome achieving from objective voice assessment (cont.)

Factors	Voice therapy outcome (n)		Chi-square, x^2	df	p-value
	Good voice	Poor voice			
5. Patient perception					
Patient's satisfaction to voice therapy service					
Good	-	3	*	-	0.231
Very good	17	16			
Patient's attitude to voice therapy					
Good	1	4	*	-	0.342
Very good	16	15			

*Fisher's Exact Test

4.3.2 Factors affecting quality of life using VHI-TH

In the beginning, the data from VHI-TH was tested for the equality of variances, using Levene's test. The results found that the factors were equal variances assumed which had degree of freedom as 34 whereas the factors were equal variances not assumed which did not have a degree of freedom as 34.

The direct and indirect factors affecting to quality of life were analyzed with mean VHI-TH scores before and after the voice therapy. These results showed that no direct factor significantly affected the mean scores of T-VHI-TH, F-VHI-TH, P-VHI-TH and E-VHI-TH before voice therapy. Except the indirect factor significantly affecting the mean scores of T-VHI-TH, P-VHI-TH and E-VHI-TH after voice therapy program was the adherence factor, in the group of voice health condition in an item of the duration of voice disorders ($t = -2.140$, $df = 34$, $p = 0.040$, $t = -2.499$, $df = 34$, $p = 0.017$ and $z = -2.470$, $p = 0.014$ respectively). (see Table 4.6)

Table 4.6 The relationship between the mean scores of VHI-TH and factors affecting to quality of life before and after the voice therapy program

Factors	Voice therapy	Independent t-test									Mann-Whitney test	
		Mean T-VHI-TH			Mean F-VHI-TH			Mean P-VHI-TH			Mean E-VHI-TH	
		t	df	p-value	t	df	p-value	t	df	p-value	z	p-value
1.Social and economic factors												
Gender	Pre	0.322	34	0.749	-0.051	34	0.960	0.820	34	0.418	-0.034	0.937
	Post	-0.696	34	0.491	-1.148	34	0.259	-0.997	34	0.326	-0.405	0.685
Education	Pre	0.847	7	0.425	0.818	7	0.441	1.042	7	0.332	-0.040	0.968
	Post	-0.395	34	0.696	0.100	8	0.923	-1.493	34	0.145	-0.205	0.838
Occupational voice disorders	Pre	0.896	34	0.377	0.460	34	0.648	1.489	34	0.146	-1.187	0.235
	Post	0.285	34	0.777	-0.144	34	0.887	0.662	34	0.513	-0.233	0.816
Health status	Pre	-0.568	34	0.574	-0.339	34	0.737	-0.489	34	0.628	-0.100	0.920
	Post	-0.472	34	0.640	-0.340	34	0.736	-0.170	34	0.866	-0.328	0.743
2.Health care team and system												
Referring period to SLP	Pre	-1.136	34	0.264	-1.117	34	0.272	-0.932	34	0.362	-0.478	0.633
	Post	0.197	34	0.845	0.141	34	0.889	0.560	34	0.579	-0.163	0.871
3.Voice health condition												
Duration of voice disorders	Pre	-0.371	34	0.713	0.611	34	0.545	-0.969	28	0.341	-0.619	0.536
	Post	-2.140	34	0.040*	-1.691	34	0.115	-2.499	34	0.017*	-2.470	0.014*
Type of voice disorders	Pre	-0.929	34	0.359	-0.690	34	0.495	-1.287	34	0.207	-0.179	0.858
	Post	0.007	34	0.994	0.144	34	0.887	0.325	34	0.747	-0.100	0.920
Severity of voice disorders	Pre	-0.167	34	0.868	-0.286	34	0.777	-0.519	34	0.607	-0.533	0.594
	Post	0.651	34	0.519	0.058	34	0.954	0.640	34	0.526	-0.722	0.470

*Significant $p < 0.05$

Table 4.6 The relationship between the mean scores of VHI-TH and factors affecting to quality of life before and after the voice therapy program (cont.)

Factors	Voice therapy	Independent t-test								Mann-Whitney test	
		Mean T-VHI-TH			Mean F-VHI-TH			Mean P-VHI-TH			Mean E-VHI-TH
		t	df	p-value	t	df	p-value	t	df	p-value	z	p-value
3.Voice health condition (cont.)												
Voice usage	Pre	-1.268	34	0.213	-1.039	34	0.306	-1.169	34	0.251	-1.430	0.153
	Post	0.261	34	0.796	0.562	34	0.578	0.313	34	0.756	-0.117	0.907
Vocal abuse behaviors	Pre	-1.765	34	0.087	-1.545	34	0.132	-1.993	34	0.054	-1.146	0.140
	Post	-1.528	27	0.138	-1.441	34	0.159	-1.534	34	0.134	-1.609	0.108
4.Treatment												
Accuracy of voice therapy at speech clinic		-0.457	34	0.650	-0.143	34	0.887	-0.114	34	0.910	-0.616	0.538
Progression of voice therapy at speech clinic		0.696	34	0.491	0.939	34	0.354	0.913	34	0.367	-0.676	0.499
Dosage of voice therapy at home												
Days per week		0.977	34	0.335	0.476	34	0.637	0.744	34	0.462	-1.544	0.123
Rounds per day		1.515	34	0.139	1.712	34	0.096	1.070	34	0.292	-1.420	0.156
Times each round		0.532	34	0.598	0.340	34	0.736	0.694	34	0.492	-0.254	0.800
Dosage		1.781	34	0.084	1.645	34	0.109	2.029	34	0.050	-1.496	0.135
5.Patient perception												
Patient's satisfaction to voice therapy service	Pre	-0.110	34	0.913	-0.414	34	0.681	0.871	34	0.390	-0.946	0.344
	Post	0.221	34	0.827	0.381	34	0.705	0.572	34	0.571	-0.264	0.792
Patient's attitude to voice therapy	Pre	0.713	34	0.481	0.189	5	0.859	1.526	34	0.136	-0.573	0.567
	Post	0.216	34	0.831	0.539	34	0.594	0.015	34	0.988	-0.446	0.656

CHAPTER V
DISCUSSION

The primary purpose of this study was to find the factors affecting voice therapy outcome. The secondary purpose was to investigate direct and indirect factors affecting the quality of life in adults with voice disorders. The following discussion was based on the information as follows:

5.1 The descriptions of the participant's variables

The descriptions of the participant's variables were classified according to adherence factors (see Table 4.1).

5.1.1 Social and economic factors

There were more female participants than male participants (69.4% and 30.6% respectively). The results were similar to those of Roy et al. (8), Houtte et al. (9), Coyle et al. (10) and Roy et al. (112). This is because, in general society, there is a higher prevalence of voice disorders in females than in males. Females have anatomical differences from males, including the length of the vocal folds, tissue mass, and hyaluronic acid. The length of the vocal folds in females is shorter than in males. Females have a higher fundamental frequency. When females produce their voices at a higher frequency, they shape their vocal folds to longer lengths in order to decrease the mass of the vocal folds and increase the amount of vocal fold vibrations. This causes trauma or wounds on the vocal folds. Female also have less hyaluronic acid than men do, to heal any wounds (8-9, 113-116). The mean age of the participants was 51.31 years old (range 18-76 years old). The results were in the age range of the general population with voice disorders (9-10).

Regarding education levels, there were more participants holding undergraduate or higher level degrees than participants with lower than undergraduate

education levels (80.6% and 19.4% respectively). The results were similar to both of Roy et al. (8) and Palacios-Pérez and Sierra-Torres (118) because the lower education level participants did not attend treatment. When they sought treatment they must pay the cost of treatment and especially absent their work that caused of loss income. (118).

Concerning to occupational voice disorders of the participants, there were more occupational voice users than non-occupational voice users (61.1% and 38.1% respectively). Many occupational voice users were teachers, radio and television journalists, and actors. The result was similar to those of Stemple (91), Pasa et al. (97), Roy et al. (112), Behlau et al. (119), McHenry et al. (122), Smith et al. (123), Fritzell (124), Gotass and Starr (125) and Williams (126) in that actors and teachers used high to moderate voice quality and voice loads (120).

Health problems in the respiratory system, neurological system, endocrine system, psychological system, digestive system and etc. were found in many patients. The percentage of 80.6 of the participants had at least one health problem. The participants had health problems the same as the participants in Behlau et al. (119), Lira Luce et al. (132), Lehto et al. (133) and Makarabhirom (2) because the health problems especially respiratory system diseases are a risk factor of voice disorders.

5.1.2 Health care team and system

The referring period to SLP, many participants (72.2%) waited for consulting the SLP. The result was similar to Frankel et al. (135) because both studies' referring periods of the many attenders were between 1-2 weeks because of forgetting, work commitments, illness, and so on. The other reason was that the SLP had a heavy work load. Patients were assigned for voice assessment or voice therapy all day. Sometimes, new patients, who were referred from an ENT doctor, had to be postponed to another day. All these reasons together, caused delays.

5.1.3 Voice health condition

The duration of voice disorders of many participants had more than 1 year (52.8%) because they had a gradual change of voice problems and did not seek for treatment. Thus the prolonged duration of voice disorders were increased (12).

The type of voice disorders of the participants had organic voice disorders than nonorganic voice disorders (61.1%and 38.1% respectively). The result was similar to both of Houtte et al. (9) and Coyle et al. (10) Because it showed the organic voice disorder effects on the several causes of voice disorders such as vocal nodules, polyp, cyst, unilateral vocal fold paralysis and etc. Plus, many participants were occupational voice user. They had an excessive vocal fold function and did not seek for early intervention. Thus the nonorganic voice disorders might develop to organic voice disorders. For example patients had hoarseness from vocal abuse. They did not change behavior and the vocal folds were injured again and again. The vocal nodules might occur.

The severity of voice disorders had several degrees in both groups of participants, including those who had a different type of voice disorder, and those who had the same type of voice disorder. But it had a different severity of voice disorder, for example the patient who had soft vocal nodule or who had fibrotic vocal nodule. Two participants from perceptual voice assessment and 3 participants from objective voice assessment showed normal voice quality before voice therapy because they had chief complaints only vocal fatigue or vocal strain (Table 4.3). Nevertheless, vocal fatigue occurred after prolonged talking (12). In the voice assessment period, some patients prolonged the vowel sound for less than 3-5 seconds. This was not a long enough duration to show any vocal fatigue.

The range of voice usage of many participants was 0-6 hour per day (77.8%). The result was similar to several studies such as Rantala et al. (144), Smith et al. (146), Da Costa et al. (149) and Côrtes Gama et al. (150) due to the large number of voice usage users being a risk factor of voice disorders.

The vocal abuse behaviors, in general there were throat clearing or cough, speaking in loud background noise, vocal strain, talkative, hard glottal attack, singing, speaking with neck shrink, shouting, used residual air to speak and imitation of the sound. This present study found many participants (52.8%) had 1-5 behaviors. The participants had vocal abuse behaviors similar to those in Behlau et al. (119), Kankare et al. (147) and Makarabhirom (2) because the vocal abuse behaviors especially throat clearing and vocal strain were a risk factor of voice disorders.

5.1.4 Treatment

An accuracy of voice therapy at speech clinic, 25 participants (69.4%) had 60-100% (see Table 4.1). The result was similar to Makarabhiron (2) which supported that the patients who accomplished at 60%-80% of accuracy of voice therapy improved voice quality. Thus, the patients who had higher percentages of the accuracy of voice therapy could improve their voice qualities more than the lower one.

The progression of voice therapy at speech clinic, 24 participants (66.7%) had 60-100% (see Table 4.1). The results were supported by Colton et al. (12) in that the positive outcomes of voice therapy depended on positive progress of voice therapy.

The dosage of voice therapy at home, 19 participants (52.8%) practiced more than 4 days per week, 32 participants (88.9%) drilled between1 to 10 rounds per day, and 26 participants (72.2%) did between 1 to 10 each round. (see Table 4.1) Fourteen participants (38.9%) used pattern 1 (1-4 days per week, 1-10 rounds per day, and 1-10 times each round). The dosage of voice therapy at home of 29 participants (80.6%) were low dosage. (see Table 4.2) The result was similar to Makarabhiron (2) because the patients who had low dosage of voice therapy at home had better voice quality. However the patients who had high dosage of voice therapy at home tended to improve voice quality better than the patients who had low dosage of voice therapy at home.

5.1.5 Patient perception

Thirty-three participants (91.7%) had a very good satisfaction to voice therapy service that reflected a good relationship between patient and SLP. The results were supported by WHO (33) and Colton et al. (12) in that the positive outcomes of voice therapy depended on adherence of voice therapy factors particular the factor related with a good relationship between patients and the SLP.

There were 31 participants (86.1%) who had a very good attitude towards voice therapy. The results were supported by the WHO (33) and Colton et al. (12) because the positive outcomes of voice therapy depended on the adherence of voice therapy and a good attitude to treatment.

5.2 Measurements of voice therapy outcomes

The two sections of discussion were the perceptual and objective assessment of voice quality, and quality of life.

5.2.1 Perceptual and objective assessment of voice quality

After voice therapy, 14 participants (38.9%) had normal voice quality. Nineteen participants (52.8%) had improved their voice quality. The comparisons of voice quality before and after voice therapy were significantly different ($p < 0.001$). For the objective voice assessment, 17 participants (47.2%) had normal voice quality. 24 participants (69.4%) had improved voice quality. The comparisons of voice quality before and after voice therapy showed significant differences ($p < 0.001$). The Spearman's rho test was used to find the correlation between objective and perceptual voice assessment after voice therapy. The result was significant ($p = 0.001$) (see Table 4.3). The results were similar to those of Makarabhiron (2), Speyer et al. (19), Carding et al. (24), Chen et al. (48), Speyer (75) and Amir et al. (30) because the voice therapy was an effective treatment for the patients with voice disorders to improve their voice quality. According to this because it was used as a direct treatment at the laryngeal mechanism and it modified the incorrect voice production, which included respiration, phonation, resonation and articulation (24).

5.2.2 Quality of life measurement

After voice therapy, all of the participants except one had decreased their mean T-VHI-TH scores. The one who had increased her mean T-VHI-TH scores. Since she was not aware her voice change in her daily life before taking voice therapy session. After voice therapy, this patient had a better knowledge of voice disorders and voice therapy. Reason why she could increase her awareness of her own handicap. These reasons are associated with Jacobson et al. (20). The comparisons of T-VHI-TH, F-VHI-TH, P-VHI-TH and E-VHI-TH scores before and after voice therapy showed significant differences ($p < 0.001$ for all) (see Table 4.5). The results were similar to those of Behlau et al. (21), Taguchi et al. (43), Behrman et al. (50), Bowie et al. (51) and Roy et al. (96) because it showed that voice therapy was an effective

treatment to decrease the handicap caused by voice disorders and increase the quality of life of patients with voice disorders.

5.3 The relationship between the adherence factors related to voice therapy outcome

The factors in this study were categorized according to the aspects of adherence of therapy and were analyzed with the effectiveness of voice therapy outcome (voice quality from objective voice assessment and quality of life from VHI-TH after voice therapy). There were 2 sections of discussion below:

5.3.1 Factors affecting voice quality by objective voice assessment

5.3.1.1 Social and economic factors

These results found that there were no factors in the role of social and economic factors significantly affected the voice therapy outcome. The relationship between gender and voice therapy outcome was similar to Makarabhirom (2) and Speyer et al. (19). Although females have a higher risk of voice disorders than males do, this is due to differences in the anatomy and physiology of voice production (8, 113-116). However when females have voice changes, they attend voice therapy more than males do (9). Heaver (117) supported results that males were not aware of voice change and did not realize the importance of voice therapy. Therefore, males had lower rates to seek out voice therapy than women had.

Education was not a factor affecting voice therapy outcome. The results were similar to Makarabhirom (2) in that the SLP followed up with patients every week. The patients could easily contact the SLP; it was easy for the patients to request more information. This study stands in contrary to two previous studies that documented that education was related to voice disorders because lower educated participants had a lack of knowledge about health care and preventative disease (8, 118).

Occupational voice disorders were not a factor affecting voice therapy outcome. The occupational and non-occupational voice users presented approximately equal voice quality after voice therapy. The result was similar to

Makarabhirom (2) and Yun et al. (130) in that the SLP did not only recognize occupation, but was also concerned about voice usage and vocal load (129-130). Smith et al. (146) advocated that having the same occupation (physician teacher, computer science teacher, or math teacher) but a different voice usage level had a different influence on voice disorders also. However, occupational voice users such as teachers or singers, have a high risk of voice disorders (120-122).

Health status was not a factor affecting voice therapy outcome. The result is associated with Makarabhirom (2) due to the patients received treatment for their health problems before attending voice therapy. The symptoms of the health problems did not occur during the voice therapy program. However, health problems, including respiratory tract infections, respiratory allergies, asthma, gastroesophageal reflux disease, abnormality of thyroid and stress are related to voice disorders (12, 119, 131-133) because these diseases cause structural changes within the larynx, especially vocal folds tissues.

5.3.1.2 Health care team and system

Researchers considered health care teams and system-related factors and found it did not affect voice therapy outcome. The referring period to the SLP did not affected the outcome. The referring period to the SLP was not a factor affecting voice therapy outcome because the mean period of time in the present study was lower than the mean period of time in the study done by Maira et al, 7.12 days versus 20.1 days respectively (35). Reviewing literatures found that prolonged times of referral between two weeks until two months, influenced attendance of treatment (135-137).

5.3.1.3 Voice health condition

There were two factors in this topic that significantly affected voice therapy outcome (severity of voice disorders and voice usage). The severity of voice disorders also significantly affected voice therapy outcomes ($p = 0.006$). The results related to Makarabhirom (2) in that mild severity of voice disorders tended to be more affected by voice therapy than the moderate and severe voice disorders. The patients who had sudden voice disorders or voice disorders affecting their work performance wanted to seek professional care to treat their voice disorders (12, 112-113, 124). However, the previous study showed different results, including

Hapner et al. (32) and Santos et al. (134). These results presented that the severity of voice disorders did not relate to the completion or discharge of voice therapy because the patients who had severe voice disorders might decrease sensitivity of dysphonia or have a compensation of voice production (36).

Voice usage significantly affected voice therapy outcomes ($p = 0.016$). The results associated with the results of Smith et al. (146), Kankare et al. (147) and Carroll et al. (148). Because the high risk of voice disorders occurred from higher voice usage, there was not enough time for voice rest to foster recovery to the vocal folds (91, 112, 120, 122, 125, 129, 141-142). For instance, higher voice usage was the cause of vocal fatigue. Many participants had range of voice usage, from 0-6 hours per day. This was approximated in the previous studies (146-147). The range of voice usage in the present study was enough to affect the effectiveness of voice therapy outcome. However the results in the present study were different from Da Costa et al. (149) and Côrtes Gama et al. (150) in that voice usage in this study (0-6 hours/day) was more than the previous study (2.5-5 hours/day).

There were other factors in this topic that did not affect voice therapy outcome, including the duration of voice disorders, the type of voice disorder and any vocal abuse behaviors. The duration of voice disorders was not a factor affecting voice therapy outcome. The result was similar to Behrman et al. (36) and Yun et al. (130) due to during prolonged duration of voice disorders, the patients might decrease their sensitivity of dysphonia, and increase the compensation of voice production (36). Moreover, early intervention for voice disorders was an important issue because it helped to decrease the chronic dysphonia and severity of lesion at the vocal folds (12).

The type of voice disorder was not a factor that affected voice therapy outcome. The result was similar to Schindler et al. (47) and Speyer et al. (138) but did not show the significant level. After voice therapy, the patients who had organic or nonorganic voice disorders, both received the benefits of therapy, but they received different degrees of benefits. For instance, voice therapy significantly helped a patient who had slight vocal fold abnormalities improve their voice quality, but it only slightly helped the patient who had unilateral vocal fold paralysis improve their voice quality (19). In addition, different types of voice disorders might show the same

severity of voice disorders (47). Even though the type of voice disorder did not affect the effectiveness of voice therapy outcome, the patients who had nonorganic voice disorders tended to improve their voice qualities more than the patients who had organic voice disorders, because some organic voice disorders depend on vocal fold tissue recovery including vocal nodule (91, 112, 120, 122, 125, 129, 141-142).

Vocal abuse behaviors were not a factor affecting voice therapy outcome. The result was similar to Makarabirom (2) and Broaddus-Lawrence et al. (95) because during therapy sessions the patients could eliminate vocal abusive behaviors. Resulting in the abnormalities within vocal folds decreased (2). Eliminating vocal abuse behaviors itself might not be enough to decreased the severity of voice disorders. However the patients who had a large amount of vocal abuse behaviors such as throat clearing, using a loud voice and having vocal strain led to voice disorders (119, 147, 152).

5.3.1.4 Treatment

The accuracy of voice therapy at speech clinic significantly affected voice therapy outcomes ($p = 0.021$). The result related to Makarabhirom (2) because the improvement of voice quality was depended on the patient's accuracy of voice therapy at speech clinic rather than the frequency of voice therapy session.

The progression of voice therapy significantly affected voice therapy outcomes ($p = 0.009$). The result related to Colton et al. (12) in that the positive progression of voice therapy would affect to positive prognosis of voice therapy.

On the other hand, the dosage of voice therapy at home was not a factor affecting voice therapy outcome. The result was similar to Makarabhirom (2) due to the patients told the researcher that they forgot to record the frequency of therapy during practice or did not record the frequency of the past practice that was achieved and generalized in daily living (2). The dosage of voice therapy at home in the present study showed that low dosage, in pattern 1 (1-4 days per week, 1-10 rounds per day and 1-10 times each round) was enough to provide effective voice therapy. Xu et al. (161) confirmed that the patients who practiced at home 20-30 minutes per week for 3 months period had improvement in their voice quality.

5.3.1.5 Patient perception

The patient's satisfaction to voice therapy service was not a factor affecting voice therapy outcome because all of the patients had good relationships with their SLP. The variables of the patient's satisfaction score in the present study were limited (only good and very good). Therefore, the result did not show any correlation between the patient's satisfaction score versus voice therapy outcome. Moreover the patient's satisfaction to voice therapy service questionnaire was not appropriate material to measure the relationship between patients and SLP. However good relationships between patients and SLPs might increase adherence of therapy and lead to greater achievement of goals in voice therapy (12, 33).

The patient's attitude to voice therapy was not a factor affecting voice therapy outcome because all of the patients had good attitudes towards voice disorders. The variables of the patients' attitudes to voice therapy factors were analyzed in the present study. There were only responses of good and very good as well as the satisfaction questionnaire was also not completely enough to measure these factors. Therefore, the results did not show a correlation between the patient's attitude towards voice therapy and voice therapy outcome. However a good patient's attitude to voice therapy might increase adherence of therapy and achievement of goals in voice therapy (12, 33).

5.3.2 Factors affecting quality of life using VHI-TH

The direct factors affecting quality of life were analyzed from mean VHI-TH scores before voice therapy. Gender, occupation voice disorders and type of voice disorder factors were analyzed in many previous studies, but in the present study the researcher added more factors according to adherence factors such as gender education, occupation voice disorders, health status, referring period to the SLP, relationship between patients and the SLP, duration of voice disorders, type of voice disorders, severity of voice disorders, voice usage, vocal abuse behavior, accuracy of voice therapy at speech clinic, dosage of voice therapy at home and the patients' attitudes towards voice therapy factors. No direct factors significantly affected quality of life (see Table 4.6). The gender factors in the present results were similar to Jaruchinda and Suwanwarangkool (22), Behrman et al. (36), Guimarães et al. (37),

Helidoni et al. (38), Schindler et al. (39), Malki et al. (40), Datta et al. (41), Menon et al. (42), Taguchi et al. (43), Bonetti and Bonetti (44), Rosen and Murry (45), Hakkesteegt et al. (46), Moradi et al. (155) and Amir et al. (156) due to voice disorders affect the quality of life in both of females and males (40). The occupational factor in the present results was different from Behrman et al. (36) and Rosen and Murry (45) in that the patients who had occupational voice user had higher levels of handicap than the patients who had non-occupational voice user, and patients who had occupational voice user over rated their handicap (36). The type of voice disorders factors in the present result was different from Taguchi et al. (43) and Rosen and Murry (45) in that the present study had different classifications of type of voice disorders and a small number of subjects to collect data. The patients who had vocal fold paralysis presented higher VHI scores because they encountered disturbance in daily life including severe breathiness and shortened phonation time (43).

The present study was different from past studies that analyzed the relationship between the factors and quality of life after voice therapy program. The factors that were analyzed with VHI-TH scores after voice therapy were called indirect factors. Only one indirect factor, the duration of voice disorder, significantly affected quality of life by measuring from T-VHI-TH, P-VHI-TH and E-VHI-TH ($p = 0.040$, $p = 0.017$ and $p = 0.014$ respectively) (see Table 4.6). These results related to physical and emotional scales because both of this subscales directly represented the patient's self-perception of laryngeal discomfort and affective response to voice disorders respectively. For instance, the duration of voice disorders was an indirect factor affecting quality of life because the patients who had a prolonged duration of voice disorder had habituation or decreased sensitivity of their voice problems (39). In addition, after voice therapy the patients might have increased their awareness of their voice production, and decreased their frequency of vocal abuse behaviors. The VHI-TH scores outcome was lower than before voice therapy, and the score presented the residual degree of handicap on daily living. The patients might have the motivation to practice (20).

The present study had a few factors affecting quality of life because the patients perceived their handicap from voice disorders in different ways, when observed from the wide range of T-VHI-TH scores before and after voice therapy

(12-89 scores and 0-65 scores respectively). Jacobson et al. (20) supported this reason that the patients with same voice disorders might have different levels of handicap. Thus VHI can be used to evaluate patient's impact of his or her voice upon daily activities.

In summary of the results in the present study the factors affecting voice therapy outcome and quality of life for individual patients were differences (19). The factors affecting voice therapy outcome and quality of life depended on the priority of factors according to what patients consideration.

CHAPTER VI
CONCLUSIONS

The purpose of this research was to examine the factors affecting voice therapy outcomes and to investigate the direct and indirect factors affecting quality of life in 36 adults with voice disorders in the speech clinic at Ramathibodi Hospital. The findings of this study suggested the following conclusions:

1. The factors affecting voice therapy outcome were severity of voice disorders, voice usage, accuracy and progression of voice therapy at speech clinic. The reasons supporting that the patients with mild severity of voice disorders tended to be approved by voice therapy than the moderate and severe voice disorders. Moreover the patients with extreme voice usage had high risk of voice disorders that caused vocal hyperfunction. By means of an improvement of voice quality, it depended on the accuracy of voice therapy and progression of voice therapy that evaluated and treated by the SLP at speech clinic.

2. None of the direct factors affected quality of life because the patients' perception about their handicap from voice disorders were different which observed from the wide range of the VHI-TH scores.

3. The indirect factor affecting quality of life was the duration of voice disorders. As a result of the VHI-TH scores reflected the degree of the handicap in their daily lives. These scores might increase the patient's motivation to practice.

Recommendations

From the results of this study, some recommendations for the further research are as follows:

1. The sample size should be increased more than this study, in order to increase estimated numbers of the variables of the data and the power of the testing.

2. The researcher should add a control group that are the patients who attend voice therapy in routine practice, to compare the data which lead to increase the reliability of the results.

3.The researcher should consider and study the relationship between the other factors affecting voice therapy outcome especially an accuracy of voice therapy program at home and how to monitor it.

4. According to the measurement of the factors about the relationship between patients and SLP as well as patient's attitude to voice therapy, further study should be added the specific question related with personal amity to interview since the satisfaction questions might not enough to measure these factors.

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APPENDICES

APPENDIX A

The demographic and medical history questionnaire

ชื่อ……..…… อายุ ……..…ปี H.N..... วันที่…….....…

สถานภาพสมรส ☐1.โสด ☐ 2.คู่ ☐3.หย่า ☐4.หม้ายจำนวนบุตร….คน

การศึกษา ☐1.ประถมศึกษา ☐ 2.มัธยมศึกษา ☐3.ปวช./ปวส. ☐4.อนุปริญญา ☐ 5.ปริญญาตรี

☐ 6.ปริญญาโท ☐ 7.ปริญญาเอก ☐ 8.อื่นๆระบุ .....

อาชีพ ☐1.เกษตรกรรม ☐ 2.ช่างก่อสร้าง ☐ 3.ค้าขาย ☐ 4.กรรมกร ☐5.ครู-อาจารย์

☐6.เจ้าหน้าที่สาธารณสุข ☐7.ข้าราชการอื่นๆ ☐8.อื่นๆ ระบุ .....

ที่อยู่……..……..……..……..……..……..……..……..……..……..……..……..

โทรศัพท์ที่บ้าน……..……..……..โทรศัพท์ที่ทำงาน……..……..……

การใช้เสียงในที่ทำงาน เฉลี่ยวันละ …….....……ช.ม. การใช้เสียงที่บ้านเฉลี่ยวันละ……...……ชม.

การใช้เสียงลักษณะอื่นๆ เฉลี่ยวันละ ……..……..ช.ม. รวมการใช้เสียงเฉลี่ยวันละ……..……..ชม.

<u>ประวัติการตรวจรักษาทางการแพทย์</u>

วันที่มาพบแพทย์.....อาการสำคัญที่มาพบแพทย์.……..……

ผลการวินิจฉัยของแพทย์.....การรักษาที่ได้รับ.....

วันที่แพทย์ส่งต่อนักแก้ไขการพูด.....

<u>ความเป็นมาของปัญหา</u>

1.ท่านเริ่มมีปัญหาเรื่องการใช้เสียงตั้งแต่……..……..สาเหตุเกิดจาก ……..……...……..

2.ความเป็นมาของปัญหาเรื่องเสียงตั้งแต่เริ่มมีปัญหาเสียงผิดปกติ

☐1.ดีขึ้น ☐2.คงที่ ☐3.เลวลง ☐4.เป็นๆหายๆ ☐5.เป็นตลอดเวลา

3.ช่วงเวลาที่มีเสียงผิดปกติมากขึ้น ☐1.เช้า ☐2.กลางวัน ☐3.เย็น ☐4.เป็นเท่ากันตลอดทั้งวัน

โปรดอธิบายถึงลักษณะความผิดปกติของเสียง……..……..……..…….....

4. ท่านคิดว่าสาเหตุของเสียงผิดปกติคือ

☐1.ใช้เสียง สอน/พูดมากเกินไป ☐2.เป็นหวัด ☐3.พูดในที่เสียงดังเป็นประจำ ☐4.ดื่มแอลกอฮอล์

☐5.ใช้เสียงผิดวิธี เช่น ตะโกน พูดดัดเสียง ☐6. อื่นๆ ระบุ.....

5.ความคาดหวังต่อผลการรักษา.....

6. คุณภาพเสียงในวันนี้เป็นอย่างไร ☐1.เหมือนทุกวัน ☐2.แย่ลง ☐3.ดีขึ้น

7. ท่านเคยรับการรักษาเสียงแหบมาก่อนหรือไม่ ☐1.ไม่เคย ☐2.เคยโดยวิธี.....

☐1.กินยา ☐2.ฉีดยาเข้าเส้นเสียง ☐3.ผ่าตัด ☐4.ฝึกพูด โดย.....

ระยะเวลาในการฝึกพูด นาน……เดือน/ปี ฝึกครั้งละ……นาที ผลการรักษา.....

☐5.อื่นๆ ระบุ.....

<u>พฤติกรรมการใช้เสียง</u>

☐1.เค้นเสียงพูด ☐2.เค้นเกร็งลำคอขณะพูด ☐3.พูดยาวๆ ติดต่อกันจนหมดช่วงลมหายใจแล้วยังพูดต่อ

☐4.รู้สึกคอแห้งเหมือนมีอะไรติดคอต้องกระแอม ไอบ่อยๆ ☐5.ชอบตะโกน ตะเบ็ง ☐6.พูดคุยในที่มีเสียงดัง

☐7.พูดมาก หรือชอบร้องเพลง ☐8.พูดกระแทกเสียง ☐9.ชอบเลียนเสียงแปลก ๆ

☐10.เป็นคนช่างพูดคุย ☐11.อื่นๆ ระบุ……

<u>สิ่งแวดล้อมที่มีผลกระทบต่อการใช้เสียง</u>

ที่บ้าน/ ทำงาน ☐1.เสียงดัง ☐2.ฝุ่นละออง,ควัน ☐3.อื่นๆ ระบุ……

สูบบุหรี่ ☐1.ไม่สูบ ☐2.สูบประจำ วันละ……สูบมานาน ....ปี ☐3.เคยสูบ แต่เลิกไปแล้ว ……ปี ☐4.อื่นๆ.....

ดื่มสุรา หรือเครื่องดื่มที่มีแอลกอฮอล์ ☐1.ไม่ดื่ม ☐2.ดื่มประจำวันละ.....ดื่มมานาน…ปี ☐3.ดื่มนานๆครั้ง

☐4.เคยดื่มแต่เลิกไปแล้ว……..ปี ☐5.อื่นๆ.....

<u>ปัญหาทางสุขภาพ</u>

โรคทางเดินหายใจ ☐1.ไม่มี ☐2.มี ระบุ…….. โรคปอด ☐1.ไม่มี ☐2.มี ระบุ……..

โรคเกี่ยวกับหู ☐1.ไม่มี ☐2.มี ระบุ…….. โรคระบบประสาท ☐1.ไม่มี ☐2.มี ระบุ……

โรคทางจิตเวช ☐1.ไม่มี ☐2.มี ระบุ…….. โรคหัวใจและหลอดเลือด☐1.ไม่มี ☐2.มี ระบุ……

โรคกระดูกและโรคข้อ☐1.ไม่มี ☐2.มี ระบุ…….. อัมพฤกษ์ ☐1.ไม่มี ☐2.มี ระบุ……..

ชัก ☐1.ไม่มี ☐2.มี ระบุ……..

ปัญหาในการควบคุมกล้ามเนื้อใบหน้า, ลิ้น ☐1.ไม่มี ☐2.มี ระบุ……..

โรคของต่อมไร้ท่อ-การเปลี่ยนแปลงทางฮอร์โมน ☐1.ไม่มี ☐2.มี ระบุ……..

<u>เคยได้รับบาดเจ็บ หรือการผ่าตัด</u>

☐1.กระดูกซี่โครงหัก ☐2.ผ่าตัดกล่องเสียง ☐3.ผ่าตัดต่อมไทรอยด์ ☐4.ผ่าตัดหัวใจ ☐5.ผ่าตัดทรวงอก ☐6.เจาะคอ

ความผิดปกติอื่นๆ

☐1.เนื้องอกในช่องอก ☐2.ไส้เลื่อนของกระบังลม ☐3.อื่น ๆ ระบุ.....

<u>ยาที่รับประทานเป็นประจำในช่วง 3-6 เดือนที่ผ่านมา</u>

☐1.ฮอร์โมน ☐2.ยาขับปัสสาวะ ☐3.ยาลดความดันโลหิต ☐4.ยารักษาโรคภูมิแพ้ ☐5.ยาลดน้ำมูก

☐6.ยารักษาโรคข้ออักเสบ ☐7.ยาปฏิชีวนะ ☐8.ยานอนหลับ ☐9.อื่น ๆ ระบุ.....

APPENDIX B

The voice handicap index version Thai language (VHI-TH)

ชื่อ_____วันที่_____H.N._____ ครั้งที่_____

โปรดใส่เครื่องหมาย✓ ในช่องว่างด้านล่างโดยข้อความเหล่านี้ เป็นการรวบรวมถึงการอธิบายปัญหาเสียงผิดปกติ โปรดระบุถึงความถี่ในการเกิดปัญหาว่ามีมากน้อยเพียงใดตามเกณฑ์ในตาราง

ลักษณะเสียงและผลกระทบ	ไม่เคย (0)	เกือบไม่เคย (1)	บางครั้ง (2)	เกือบทุกครั้ง (3)	ทุกครั้ง (4)
1.บุคคลทั่วไปฟังเสียงพูดของฉันด้วยความยากลำบาก					
2.ลมในการเปล่งเสียงของฉันหายไปเวลาฉันพูด					
3.บุคคลอื่นเข้าใจคำพูดของฉันได้ลำบากในห้องที่มีเสียงรบกวน					
4.เสียงของฉันมีการเปลี่ยนแปลงขึ้นลงในระหว่างวัน					
5.ครอบครัวของฉันมีปัญหาในการได้ยินฉันเมื่อฉันส่งเสียงเรียกจากส่วนอื่นของบ้าน					
6.ฉันใช้โทรศัพท์น้อยลงกว่าที่ฉันต้องการ					
7.ฉันรู้สึกเครียดเวลาพูดกับบุคคลอื่นเนื่องจากเสียงของฉัน					
8.ฉันมักจะหลบเลี่ยงพบกลุ่มผู้คนเนื่องจากปัญหาเสียงของฉัน					
9.บุคคลอื่นรู้สึกรำคาญเสียงพูดของฉัน					
10.บุคคลอื่นมักถามฉันว่า “เสียงของคุณเป็นอะไร”					
11.ฉันพูดคุยกับเพื่อน,เพื่อนบ้าน,หรือญาติ น้อยกว่าที่ควรเนื่องจากปัญหาเสียงของฉัน					
12.เมื่อฉันสนทนาต่อหน้าบุคคลอื่น เขามักขอให้ฉันพูดซ้ำ					
13.เสียงของฉันแหบแห้ง					
14.ฉันรู้สึกต้องพยายามเค้นเสียงในการพูด					

ลักษณะเสียงและผลกระทบ	ไม่เคย (0)	เกือบไม่เคย (1)	บางครั้ง (2)	เกือบทุกครั้ง (3)	ทุกครั้ง (4)
15.บุคคลอื่นไม่เข้าใจปัญหาเสียงของฉัน					
16.ปัญหาทางเสียงของฉัน มีผลต่อชีวิตฉันทั้งด้านส่วนตัวและสังคม					
17.ความชัดเจนของเสียงฉัน ไม่สามารถคาดเดาได้					
18.ฉันพยายามเปลี่ยนเสียงพูดให้แตกต่างไปจากเดิม					
19.ฉันรู้สึกถูกแยกออกจากวงสนทนา เนื่องจากปัญหาเรื่องเสียงของฉัน					
20.ฉันใช้ความพยายามอย่างมากในการพูด					
21.เสียงของฉันแย่ลงกว่าเดิมในเวลาเย็น					
22.ปัญหาเรื่องเสียง ทำให้ฉันต้องสูญเสียรายได้					
23.ปัญหาเรื่องเสียงของฉันทำให้ฉันรู้สึกหงุดหงิด รำคาญใจ					
24.ปัญหาเรื่องเสียงของฉันทำให้ฉันออกจากบ้านลดลง					
25.เสียงของฉันทำให้ฉันรู้สึกเสมือนเป็นบุคคลทุพพลภาพ					
26.เสียงของฉันหายไปในช่วงระหว่างการพูด					
27.ฉันรู้สึกรำคาญเมื่อมีคนขอให้ฉันพูดซ้ำ					
28.ฉันรู้สึกอายเมื่อมีคนขอให้ฉันพูดซ้ำ					
29.เสียงของฉันทำให้ฉันรู้สึกด้อยความสามารถ					
30.ฉันรู้สึกอับอายเกี่ยวกับปัญหาเสียงของฉัน					

APPENDIX C

The perceptual voice evaluation recording form

วันที่.....H.N.....ครั้งที่.....

ชื่อ……...…….....…...อายุ ……...…ปี

โปรดใส่เครื่องหมายกากบาท (X) ตามความคิดเห็นของผู้ประเมิน

ผลการประเมินGIRBAS

Instability	☐ 0.Normal	☐ 1.Slight	☐ 2.Moderate	☐ 3. Severe
Roughness	☐ 0.Normal	☐ 1.Slight	☐ 2.Moderate	☐ 3. Severe
Breathiness	☐ 0.Normal	☐ 1.Slight	☐ 2.Moderate	☐ 3. Severe
Asthenia	☐ 0.Normal	☐ 1.Slight	☐ 2.Moderate	☐ 3. Severe
Strain	☐ 0.Normal	☐ 1.Slight	☐ 2.Moderate	☐ 3. Severe
Total points	_____ points			
Grade	☐ 0.Normal (0 point)		☐ 1.Slight (1-5points)	
	☐ 2.Moderate (6-10points)		☐ 3. Severe (11-15points)	

APPENDIX D

The objective voice evaluation recording form

วันที่…….....…… H.N.....

ชื่อ…….…….....…..อายุ ……...…ปี

ผลการประเมินจากเครื่องมือ Dr.Speech5 โปรแกรม Vocal assessment

<u>การประเมินแรกรับ</u>

Hoarse voice	☐ 0.Normal	☐ 1.Mild	☐ 2.Moderate	☐ 3. Severe
Harsh voice	☐ 0.Normal	☐ 1.Mild	☐ 2.Moderate	☐ 3. Severe
Breathy voice	☐ 0.Normal	☐ 1.Mild	☐ 2.Moderate	☐ 3. Severe
Grade	☐ 0.Normal (0 point)		☐ 1.Slight (1-3points)	
	☐ 2.Moderate (4-6points)		☐ 3. Severe (7-9points)	

<u>การวัดผลหลังจากการฝึกเสียงในสัปดาห์ที่</u> <u>10</u>

Hoarse voice	☐ 0.Normal	☐ 1.Mild	☐ 2.Moderate	☐ 3. Severe
Harsh voice	☐ 0.Normal	☐ 1.Mild	☐ 2.Moderate	☐ 3. Severe
Breathy voice	☐ 0.Normal	☐ 1.Mild	☐ 2.Moderate	☐ 3. Severe
Grade	☐ 0.Normal (0 point)		☐ 1.Slight (1-3points)	
	☐ 2.Moderate (4-6points)		☐ 3. Severe (7-9points)	

APPENDIX E

Patient's satisfaction to voice therapy service

โปรดใส่เครื่องหมาย ✓ ตามความคิดเห็นของผู้ประเมิน

หัวข้อการพิจารณา	มากที่สุด (5)	มาก (4)	ปานกลาง (3)	น้อย (2)	น้อยที่สุด (1)
1) เจ้าหน้าที่/ นักแก้ไขการพูด – ความเหมาะสมในการแต่งกาย/ บุคลิก/ ท่าทางการให้บริการ – บริการด้วยความสุภาพและด้วยไมตรีจิต – บริการด้วยความกระตือรือร้น รวดเร็ว ฉับไว – ความรู้ ความสามารถในการบริการเช่น การตอบคำถาม ชี้แจงข้อสงสัย บริการด้วยความเสมอภาค เป็นธรรม ไม่เลือกปฏิบัติ					
2) คุณภาพของโครงการ – ได้รับบริการหรือเข้าร่วมโครงการอย่างประทับใจ – ได้รับบริการหรือเข้าร่วมโครงการตรงความต้องการ – ได้รับบริการหรือเข้าร่วมโครงการที่เป็นประโยชน์ – สามารถนำความรู้ ในการได้รับบริการหรือเข้าร่วมโครงการไปใช้ในชีวิตประจำวัน					

APPENDIX F

The voice therapy recording form

ชื่อ……H.N.….....…...อายุ ……...…ปี

สัปดาห์	วัน-เดือน-ปี	วิธีการฝึก	ความถูกต้องของการฝึก		ความก้าวหน้าของการฝึก	ปัญหาที่พบ	วิธีแก้ปัญหา
			ถูก	ผิด			
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Percentage (%) of an accuracy of voice therapy at speech clinic

$$\frac{\text{(Patient's accuracy scores of approach 1 + approach 2 + approach 3 + approach n of all therapy sessions) x 100}}{\text{Total scores of approach 1 + approach 2 + approach 3 + approach n of all therapy sessions}}$$

Percentage (%) of progression of voice therapy at speech clinic

$$\frac{\text{Patient's tasks level scores x 100}}{\text{Total number of all tasks level x 3}}$$

APPENDIX G

Methods of voice therapy approach

All information of methods of voice therapy approach adapted from several documents (2, 23, 25, 27-28, 30-31, 81-101). The patient achieved voice therapy approach with an accuracy of voice therapy at least 80%.

Vocal hygiene education

The vocal hygiene educations are divided into three groups. The first group is “Don’t” that includes using loud voice/shouting/cheering, talking for a long time, talking in loud background noise, talking during lifting the heavy things, using the residual air volume, using hard glottal attack, using mouth breathing, throat clearing, smoking, eating less than 2-3 hours before sleeping, and staying in an environment with dust, smoke, toxic gases, and chemicals. The second group is “Decrease” that consists of using high pitch, using voice during menstruation or respiratory infection, muscle tension on face/neck/shoulder during talking, drinking alcohol/tea/coffee, and eating spicy, salty, sweet, sour food. The third group is “Do” that is follow as using amplifier, drinking water, voice rest, sleeping, setting a good alignment for standing or sitting.

Breathing exercise

The aims of this exercise are to increase vital capacity and decrease using residual air that effect on the approximation of the vocal folds and loudness. This technique can practice in sleeping, sitting and standing position. The procedures of breathing exercise start at the step to explain the phonatory, physiology, air stream outgoing, and vocal folds vibration. In addition the patients who are singer or actor should discuss about the importance of good posture. SLPs demonstrate the abdominal breathing with sigh that place the hand on the abdomen and observe its movement

during inspiration and expiration. For inspiration the diaphragm is pulled down to expand the thoracic cavity for supporting lung enlargement. At the expiration time the diaphragm back to same position together with sigh. If the patients maintain this process the SLPs will demonstrate counting five numbers per on expiration. When the patients can do it with the best phonation they change counting number to prolong vowels. The progression of patients is accepted when the patients prolong vowels more than the first time five seconds. For the advance breathing exercise patient should practice with words, phrase, sentences, and conversations.

Establish new pitch

The aim of this method is to adjust the appropriate pitch level. This technique is useful for the patients who have low pitch because of mass at the vocal folds or have high pitch because of faulty habit. The SLPs explain and demonstrate the habitual pitch and optimum pitch. They record the patient's voice during using habitual pitch and optimum pitch and play back to discriminate their voices. When the patients can imitate their own pitch model they should use optimum pitch with words, phrases, and short sentences. Many patients cannot imitate their optimum pitch model. The SLPs should show the feedback for the patients such as visual feedback by using the objective voice assessment instruments (Visi-Pitch or Dr. Speech). These instruments display the oscillation of the patients' voice frequency.

Vocal function exercise

The aim of this method is to balance the respiratory, phonatory, and resonance systems. There are four steps. The first step is warm-up that pay attention to the vibration in front of face. The second step is stretching that is glide from lowest to highest pitch of the patient's vocal range. The third step is contraction that is glide from highest to lowest pitch of the patient's vocal range. The last step is practice all steps. This research follows the four steps but applies with the lip trills. The first is only lip trills and lip trill with /b/. Second is lip trills with /b/ and control low pitch to high pitch. Third is lip trills with /b/ and control high pitch to low pitch. The last is to control lip trills with /b/ from low pitch to high pitch and high pitch to low pitch in one expiration.

Yawn – Sigh technique

The aim of this exercise is to increase muscle relaxation that relate to voice production. It is a useful technique for the patients who have vocal hyperfunction, nodules, polyps or vocal fold thickening. It adjusts the optimum of vocal fold size-mass, vocal folds approximation, pitch, loudness, quality, and resonance. It is an easy using combination with many other facilitating approaches but rarely using alone. The procedures of yawn-sigh technique include explanation about yawn roles that expand the vocal tract and relax neck muscle and sigh role that release the massive air flow. The patients do not open mouth widely during yawn but use soften phonation during sigh. SLPs demonstrate these tasks then the patients follow them. The easy to advance steps for yawn-sigh technique are sigh with /h/ sound in nonsense syllable, vowels, words, phrases, sentences, and conversations.

Chewing method

The aim of this exercise is to produce muscle relaxation in the area of tongue mandible, mouth, neck, and larynx. It is a useful technique to modify the optimum of vocal fold size-mass, vocal folds approximation, pitch, loudness, quality, and resonance. The procedures of chewing method start at the explanation of the speaking with unnecessary tension, approximated mandible, clenched teeth, and little opened mouth. The patients should relax the jaw, throat, tongue, and lips during chewing. SLPs and patients face to mirror and chew several minutes. The patients add the very soft phonation with chewing such as “yam-yam”, words, phrases, sentences, and conversations. If the patients cannot do this level they will go back to the highest successful level.

Chant talk

The aim of this method is to create muscle relaxation. The chant talk effects on the approximation of the vocal folds and loudness. It is an appropriately technique for patients who have hard glottal attack and abusive behaviors. The characteristics of chant talk usually increase pitch and prolongation with soft voice. This technique is often used well with other facilitating approaches such as chewing approach, open mouth approach, yawn-sigh approach, etc. The procedures of chant

talk SLPs explain methods that reduce effort during talk and will only use this method temporarily. SLPs demonstrate chant talk with sound recording. The patients imitate the same practice. If patients cannot chant, SLPs will present chant recording again. If patients cannot chant again, SLPs will choose another facilitating approach. If patients can chant, SLPs will do the next step. The patients read aloud a passage twenty seconds. The patients read aloud with normal voice and chant voice. SLPs record the patient's voice and play back the voice sample to discuss about the pitch difference, phonatory prolongation, and soft glottal attack. If patients maintain chant talk, they will reduce this technique and talking with normal voice.

Soft glottal attack

The aim of this method is to reduce the force of the vocal folds approximation and loudness. The SLPs record the patient's voice sample. They play the patient's voice sample and demonstrate in the contrast which is easy and soft glottal attack. The patients imitate following SLPs. The aspirated consonants should be used for the first time such as /h/, /f/, /s/, and so on. When the patients reduce the hard glottal attack they apply to pronounce words, phrases, sentences, and conversations.

Muscle relaxation

The aim of this method is to balance the muscle tone both of extrinsic and intrinsic laryngeal muscles. It is a useful technique to modify the optimum of vocal fold size-mass, vocal folds approximation, pitch, and loudness. It is divided into two methods. The first method directly adjusts the pain muscle by using the laryngeal massage. There are several techniques of laryngeal massage such as manual circumlaryngeal therapy that was developed by Aronson in the year 1980. The procedures of this begin by the SLPs press the major of hyoid bone with thumb and forefinger. Then they massage this area with circle direction. After that they do the same steps but change the area in the space between thyroid and hyoid bone. The SLPs place fingers on the back of thyroid bone and massage the sternocleidomastoid muscle to midline. The SLPs change the areas to place the fingers on the front of thyroid bone and massage muscle from upward to downward. When the patients relax they prolong

vowels with massage. If the patients have the best voice the massage will reduce. The second method uses are the indirect techniques to relax the muscle such as progressive relaxation. The progressive relaxation is created by Jacobson in the year 1962. This method uses in both of relaxation and contraction of all muscles. The first step the patients increase muscle tension at the scalp to toes. Then they relax the muscle. It is a useful technique for patients to aware and control the muscle tone.

Half – swallow boom

The aims of this method are to increase the glottis closure and loudness that are appropriate for the patients with voice disorders who have unilateral vocal fold paralysis, severe bowing of the vocal folds, or falsetto voice. SLPs instruct the patients to swallow and immediately say “boom” with the low pitch. During practice SLPs record the patients’ voices. After that the patients say “boom” louder and with less breathiness. The SLPs play back the patients’ voices for feedback to aware the normal voice. The SLPs explain the patients to turn head on right and left hand with saying “boom” and bent the chin down with saying “boom”. If the patients maintain to produce the normal voice SLPs will add word, phrase, or sentence after saying “boom”. If the patients can do this steps the SLPs will fade out the boom, swallow, and adjust the chin and head in normal alignment.

Pushing approach

The aims of this method are to achieve closure of the vocal folds. The pushing approach effects on the approximation of the vocal folds and loudness. It is appropriately technique for patients who have vocal cord paralysis or bowing of the vocal folds. The SLPs demonstrate pushing approach by raising the shoulder and sudden pushing arms down with fully extended. Other technique is to grasp the seat of a chair and push down firmly with arms. The patients do the same things. When the patients can pushing approach well the SLPs demonstrate pushing approach with prolong vowel /a:/. If the patients have a louder voice and better resonance they will try to pushing approach with words or phrases. When the patients is able to maintain good voice the pushing approach should be stopped.

APPENDIX H

The manual of weighting score for progress of voice therapy at speech clinic

All information of level of voice therapy approach adapted from several documents (2, 23, 25, 27-28, 30-31, 81-101).

Voice approaches	level	Scores
Both of hyperfunction and hypofunction		
1.Eliminated vocal abuse	vocal abuse behaviors > 2 times	1
	vocal abuse behaviors 1-2 times	2
	no vocal abuse behaviors	3
2.Breathing exercise	prolong vowels	1
	words	2
	connected speech	3
3. Establish new pitch	prolong vowels	1
	words	2
	connected speech	3
4. Vocal function exercise	lips trill	1
	lips trill with /b/	2
	lips trill with /b/ low and high pitch	3
Hyperfunction		
1. Yawn – Sigh technique	sigh, /h/ nonsense syllable or vowels	1
	words	2
	connected speech	3
2. Chewing method	say “yam – yam”	1
	words	2
	connected speech	3

The manual of weighting score for an accuracy of voice therapy at speech clinic (cont.)

Voice approaches	**level**	**Scores**
Hyperfunction (cont.)		
3. Chant talk	vowels	1
	words	2
	connected speech	3
4. Soft glottal attack	prolong /h/, /f/, /s/	1
	words	2
	connected speech	3
5. Muscle relaxation	neck and shoulder tension	1
	shoulder tension	2
	no tension	3
Hypofunction		
1. Half – swallow boom	swallow and immediately say “boom”	1
	swallow and say words	2
	swallow and say connected speech	3
2. Pushing approach	prolong vowel /a:/	1
	words	2
	connected speech	3

APPENDIX I

Passage #1

ฝนฟ้ามีวี่แววว่าจะตก ยายฉิมชวนหนูแจ๋ว แจวเรือไปหากำนันแฉ่งที่บางบ่อ หนูแจ๋วพอกหน้าปะแป้งด้วยดินสอพองดูงามดี พอถึงที่ฝูงหมาติดตามต้อนหน้าต้อนหลัง ป้าเยื้อนเอะอะเอ็ดตะโรแล้วยิ้มเบิกบานเจ้าแก้วหลานรักรี่มาทักทาย ผู้ใหญ่พูดคุยหัวเราะขบขัน สองคนซุกซนเล่นซ่อนหา หนูแจ๋วตกต้นไม้ร้องไห้งอแงยายฉิมว่าแย่ จับก้นกบยังไม่พัง

BIOGRAPHY

NAME	Ms. Tipwaree Aueworakhunanan
DATE OF BIRTH	22 August 1987
PLACE OF BIRTH	Bangkok, Thailand
INSTITUTIONS ATTENDED	Mahidol University, 2005-2008 Bachelor of Science (Communication Disorders) Mahidol University, 2012-2015 Master of Science (Communication Disorders)
RESEARCH GRANT	Supported in part by the Department of Communication Sciences and Disorders, Mahidol University
HOME ADDRESS	142 Kalpapruek 4 Kalpapruek Road Bangwa Phasricharoen Bangkok, Thailand 10160 Tel.08-6568-3441, 0-2802-4946 E-mail: noojoop@hotmail.com
PRESENTATION	The 34th National Graduate Research Conference