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THE AMOUNT, TYPE, AND SELF-PERCEPTION
OF VOCAL USE IN UNIVERSITY
VOICE STUDENTS

THESIS

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By

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This investigation explored voice use and perception of use in singers as compared with non-singers at the university. Students recorded the amount and type of their voice use for forty-eight hours. They made judgments about their use and whether a voice disturbance was present. Each student was taped, and tapes were judged for disturbances.

It was hypothesized that singers would have greater voice use and awareness than non-singers and experienced singers would have greater voice use and awareness than less experienced singers. Singers used their voices more than non-singers, but there were no differences in awareness. No differences between singer groups were noted. There was a high incidence of voice disturbances in all groups. Suggestions for future research were made.




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CHAPTER I

INTRODUCTION

The voice is a delicate mechanism, sensitive to the functioning of other body systems and to its environment. Changes in the overall balance of factors necessary for optimal functioning, even minute changes, affect vocal performance (5, 12, 13). This network of factors is especially important for singers. They are concerned not only with the use of the voice to communicate in speaking but also its use in singing, a highly specialized form of communication (7, 11).

In their article "Vocal Care for Vocal Athletes in Training," Thurman and Lawrence (16) draw the comparison between singers and other physical athletes. Both require careful conditioning, training, and pacing for their demanding task. Singing demands efficient interaction of the processes of respiration, phonation, resonance, and articulation (14, 15) as well as the disciplined use of abdominal muscles (1). Hicks and Troup (9) note that conversational speech requires more breath than singing, confirming another aspect of the greater efficiency required in singing.

This increased efficiency is an adaptation to a more demanding vocal task in which the slightest deviation in vocal functioning is a hindrance (2, 10, 12). Factors which affect the voice might be ignored successfully by the average voice user, but they cannot be ignored by the singer who demands a consistently optimal response from his vocal instrument. Brodnitz (4) notes that artistic speaking or singing requires such perfect functioning of the voice that even small structural changes may alter vocal quality. Serious consideration of all possible factors is essential for vocal health. "Unlike the pianist, violinist or flutist, the vocalist is an integrated unit, for he and his voice are one, inseparable. He can neither put down nor walk away from his instrument, and must literally live and breathe with this instrument twenty-four hours a day both socially and artistically" (6, p.38).

Thus, accurate perception of amount and type of vocal use is an important skill for the singer. Unfortunately, research suggests many inexperienced singers have yet to develop this awareness. Galloway and Berry (8) surveyed forty voice performance and pedagogy majors. Their results revealed a higher incidence of voice problems in these university voice majors than that expected in the normal population. In addition they noted a limited awareness of vocally damaging conditions. This incomplete awareness on the part of inexperienced singers coupled with

indiscriminate use of their voices could account for an increased incidence of voice problems in this population.

In order to explore this relationship, this study will investigate the university voice student's use of his voice and his awareness of that use. The amount and type of vocalization will be studied, comparing the use of the singer population with that of a non-singer population. In addition, comparisons will be made within the singer population between less and more experienced singers. The following review of the literature will present past studies which address vocal use, misuse, and overuse. In addition, it will further describe the rationale for the current investigation.

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CHAPTER II

USE, MISUSE, AND OVERUSE OF THE VOICE IN SINGERS

Use of the Voice

The use of the voice is the single most important factor in vocal health and functioning. Almost every condition which affects the body also affects the voice (7, 11, 12, 13, 15, 18, 21, 23, 27, 30, 31, 32). The most common etiology for voice disorders, however, is vocal misuse and overuse (3, 9, 10, 17, 25, 26, 30, 35). Physical changes can develop within the laryngeal tissue with repeated misuse and overuse (1, 3, 6, 9, 18, 20, 25, 34, 37). Nodules or other mass lesions can alter the regular vibratory pattern of the vocal folds, sometimes permanently (22). The singer, therefore, seeks to learn the proper vocal technique in order to maintain his vocal instrument over an extended period of time.

Singers concentrate their efforts on developing and maintaining a good technique which will enable them to produce the most beautiful voice most efficiently. Unfortunately, this good technique is often forgotten during speaking. This is especially detrimental since most people spend more time speaking per day than they do singing. Morton Cooper (10) states that the misuse of the speaking voice by singers often results in a reduction of the health

and longevity of the singing voice. The dissociation of the two is one of the most common problems in singers (29, 36). Overall, a singer should use the same concepts of vocal production during speaking as in singing (10, 20).

Misuse of the Voice

Incorrect use of the voice is divided into three categories: misuse, abuse, and overuse. Cooper defines vocal misuse as "the use of an incorrect pitch, tone focus, quality, volume, breath support, and rate, either discretely or in combinations" (9, p. 13). Misuse encompasses all parameters of vocal production. Vocal abuse is "the mistreatment of the vocal folds, as well as the laryngeal and pharyngeal musculature, by shouting, screaming, or talking in competition with noise" (9, p. 13). This encompasses not only the incorrect volume included in misuse but the forced or strained production which accompanies it. The hard glottal attack often plays a role in vocal abuse (24). Overuse is defined as excessive use of the voice.

Elements of vocal production which are most often indicated in vocal misuse and abuse are the pitch level of vocalization, the intensity level, and the initiation of vocalization. Cooper states that "vocal misuse occurs most frequently in pitch" (9, p. 16). Van Deinse, Frateur, and Keizer (36) maintain that the pitch of the speaking voice should correspond with the pitch of the singing voice. An

inappropriate pitch level can result in hoarseness and strain on the larynx (2, 17, 33).

Singing at the extremes of the vocal range over long periods of time also affects the voice (2, 6). In their article "Problems of the Singing Voice," Van Deinse et al. state that "classification of the voice is as important as examination and medical supervision of physical training students" (36, p. 433). Large (20) adds that incorrect voice classification and singing in the wrong tessitura (habitual range) lead to voice strain.

Excessive loudness in vocalization, especially over an extended period of time, can be detrimental to vocal health (4). Monitoring of the effort and volume of vocalization is impaired in noisy environments (2). Rontal, Jacob, Rontal, and Rolnick (27) cited noisy workplaces as a major factor in vocal abuse in industrial workers. Talking over noise, shouting, screaming, and loud laughing can all be abusive (25, 30, 35). Sataloff (30) adds oversinging to this list, noting that in large halls singers cannot monitor their vocal output as well.

Whispering has been cited as being traumatic for the vocal folds, especially during dysfunction (3, 30). In a study of quiet whisper, Hufnagle and Hufnagle (16) found that vocal quality was not negatively affected after a week of quiet whisper as the sole means of communication. It should be noted that the subjects were carefully instructed

in the use of a soft, easy whisper. They were instructed not to speak in noisy situations and to avoid as much as possible periods of laughing, throat clearing, coughing, and smoking. It is possible that this careful utilization of quiet whisper is not realized by most people and the use of a more forceful whisper is detrimental to the voice.

The manner in which the vocal folds are brought together at the initiation of vocalization is crucial to vocal health. A habitual hard glottal attack has been noted as being characteristic in many cases of vocal abuse (17, 33). Boone (2) further states that this type of attack requires too much vocal effort. As a result, the voice may tire easily. Other actions which force the vocal folds together can be detrimental to the vocal mechanism. Coughing and throat clearing are examples of such abusive behaviors (25, 33, 35).

Overuse has been cited as a factor which contributes to vocal misuse and abuse (3, 17). One condition which can lead to vocal misuse and abuse in singers is a heavy schedule which requires singing too frequently (20). Conservation is crucial to vocal longevity. Singers who are serious about their vocal health should reduce their vocal demand as much as possible, avoiding overuse in speaking and singing (2, 26, 35). Teter (34) lists excessive use of the voice as a primary cause of nodes on the vocal folds. Thurman and Lawrence (35) concur, adding chronic hoarseness,

laryngitis, and other pathological changes in the vocal folds as possible consequences of overuse. Punt (25) confirms the changes in the vocal folds with extended vocal use and reveals these aberrations to be common.

Ideally the cordal surfaces viewed in the laryngeal mirror should appear white, or no pinker than a pale rose, with straight edges, and reflect a delicate sheen like slipper-satin. This is usually too much to expect of a busy singer, but when one sees a deeper pink, a coarsening of the surface epithelium, and the edges a trifle irregular or oedematous...we may diagnose non-infective laryngitis due to wrong or excessive vocal use. Almost all singers' vocal folds show this condition at some time. (p.1074)

Brunner and Frank (8) studied the effects of vocal stress on the voice. They examined members of the Vienna Boys Choir and noted changes in vocal quality after exposure to vocal stress. The results of their study point to the fact that the voice changes with continued use over time. Singers acknowledge some change in the voice with use: "warming up" is considered essential to good vocal performance. Sander and Ripich note that while "unwanted edema is a common result of vocal misuse, a proper amount of tissue fluid is also apparently essential for achieving the best possible voice" (28, p. 144). These initial changes apparently improve vocal performance, but continued use accompanied by corresponding changes can eventually lead to misuse, abuse, and physical changes in the vocal mechanism. This pattern suggests overuse of the voice.

In summary, the manner in which the voice is habitually used is the single most important factor in vocal health.

The parameters of voice use most habitually abused include habitual pitch level, intensity level, and the initiation of vocalization. Use of the extremes of the pitch range is vocally strenuous, as is the use of excessively loud vocalization. Any forceful initiation of vocalization can be detrimental to the vocal folds. Often, singers concentrate their efforts on good vocal production during singing, only to ignore these same principles during speaking. A mismatch of the speaking and singing voices is often responsible for voice problems.

Overuse and the Singer

Vocal misuse includes all deviations from healthy, efficient vocalization. Vocal abuse is defined as the mistreatment of the vocal mechanism through the use of excessive loudness or force. In practicality, the two are not so easily distinguished. Specific behaviors can not be labeled unmistakably misuse or abuse. If continued over a period of time, both can result in physical changes in the vocal folds; therefore, both can be vocally damaging (9, 20, 34). No technique in speaking or singing is completely efficient at one moment or over an extended period of time. The many factors, physical and emotional, which affect the functioning of the vocal mechanism are in a constant state of flux (25, 30).

Once the limit for healthy vocalization has been reached, inefficient vocal functioning predominates. Any use of the voice beyond this point is overuse (26, 35). By definition, this inefficient vocal functioning must be included in vocal misuse. This is, therefore, a real concern. Even those individuals who may not be targeted as engaging in vocal misuse and abuse will eventually reach a point at which further vocal use is overuse and, therefore, misuse.

This is of special concern to singers. Singing requires a finely tuned vocal response; therefore, the range of vocal functioning which is acceptable is narrower than that for speech (6). In addition, since singing is more demanding than speech (1), greater vocal efficiency is required to sustain this activity over time. If vocal functioning is inefficient, overuse will become apparent more quickly. To compound the matter, singers often concentrate on good vocal production only during singing, using their voices carelessly during speaking. This combination of factors makes singers a high risk population for vocal disturbances.

Many inexperienced singers lack the awareness necessary to negotiate this series of obstacles to healthy vocalization. Brindle and Morris (5) examined vocal quality deviations in the normal adult population. They found only two percent of the population to exhibit an abnormal vocal

quality. In "A Survey of Communicative Disorders in College Vocal Performance and Pedagogy Majors", Galloway and Berry (14) tried to determine if this population which is involved in frequent voice use approximated the incidence of voice disorders in the general population, using Milisen's incidence figure of 1% for comparison.

The a priori assumption had been that vocal majors would be more aware, cautious, and careful with the vocal mechanism since it represented their profession. Instrumentalists generally care for their equipment, though most musical instruments are replaceable. With the irreplaceable vocal mechanism, the case should logically be equal or better, particularly since the tactile/proprioceptive laryngeal feedback provides a warning system for the individual during periods of laryngeal dysfunction, pain, and abuse.

These assumptions proved to be false. Only nine students were free of speech, resonance, and tone generation problems.

Eight of the remaining 31 students' difficulties were confined to articulation problems; 23 of the total surveyed had some type of voice disorder...Of the 31 students experiencing some type of problem, 15 had chronic conditions which suggested a need for therapy.

From the evidence in this study, vocal problems appear to be common among vocal majors, exceeding the national average by a staggering 56.5%... Perhaps the most significant aspect of the problems revealed by this survey is a limited awareness by the voice pedagogue and student of the danger of laryngeal damage during specific conditions. (p. 38-39)

This suggests that inexperienced singers are an especially high risk population for voice problems. A limited awareness of the voice could be conducive to vocal overuse.

Statement of the Problem

At this time, no investigation has been made regarding typical voice use for university voice students. This information would provide a valuable profile for a group which depends so much upon optimal vocal functioning. The problem of this study will be an examination of the amount and type of voice use in university voice students as compared with a non-singer population. Specific investigation of voice use, voice disturbances, and awareness of these two factors will be made. In addition, two singer groups will be contrasted in order to examine differences on the basis of experience.

The first main hypothesis of this study is that singers will use their voices more than non-singers. The second main hypothesis is that singers will exhibit a greater number of voice disturbances than non-singers. The third hypothesis is that singers will exhibit a greater awareness of their voices as measured by accuracy in judging voice use and disturbances than non-singers. The fourth main hypothesis is that singers with more experience will exhibit a greater awareness of their voices than singers with less experience. In order to test these general hypotheses, the following specific hypotheses will be tested.

1. Singers will exhibit greater total voice use than non-singers.

2. Singers with less experience will exhibit greater total voice use than singers with more experience.
3. Singers will exhibit greater singing use than non-singers.
4. Singers with less experience will exhibit greater singing use than singers with more experience.
5. Singers and non-singers will exhibit no difference in speaking use.
6. Singers with less experience will exhibit greater speaking use than singers with more experience.
7. Singers will exhibit more voice disturbances than non-singers.
8. Singers with less experience will exhibit more voice disturbances than singers with more experience.
9. Singers will exhibit a greater awareness of voice use as measured by accuracy in judging this amount than non-singers.
10. Singers with more experience will exhibit a greater awareness of voice use as measured by accuracy in judging this amount than singers with less experience.
11. Singers will exhibit a greater awareness of voice disturbances as measured by accurate perception than non-singers.
12. Singers with more experience will exhibit a greater awareness of voice disturbances as measured by

accurate perception than singers with less experience.

The next chapter will discuss the methodology to be employed in this investigation.

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CHAPTER III

METHODOLOGY

Subjects

The population studied consisted of university students enrolled at North Texas State University. Two-thirds of the students were selected from among those students who were studying voice privately through the university during the current semester. The singers were differentiated further by establishing two groups of subjects: those students who had studied voice for fewer than three years at the university level, and those students who had studied voice for three years or more at the university level. Studying voice was defined as participating in private, individual voice instruction on a regular basis.

The remaining third of the subjects were selected from among a non-singer population of university students drawn from a variety of disciplines. These subjects served as a control group for this investigation. An audiometric screening test was conducted for each subject at 1000 Hz, 2000 Hz, and 4000 Hz. Those subjects exhibiting a hearing loss greater than 25 dB (re: ANSI, 1969 (5)) at any one frequency in either ear were excluded from the study.

Voice instructors in the North Texas State University School of Music were contacted by letter and by individual appointment by the investigator. The rationale and the objectives of the study was explained to them at that time. The investigator requested the opportunity to meet with voice students and to ask for their participation in the study. Students agreeing to participate were asked to complete a subject consent form (Appendix A). These students were used in this investigation. The non-singing students were selected from introductory survey courses in the Department of Communication Disorders. Students in these classes represented a variety of disciplines which are not considered to be voice-dominant (disciplines which do not have use of the voice as a major characteristic). Likewise, only those students who agreed to participate and complete a subject consent form were included in this study.

Voice Log

All subjects were instructed in small groups of twenty students or less at which time they received a consent form, an instruction sheet, a voice log, and a sample voice log (Appendix B). There was an opportunity to ask questions. The students received a list of times during which they could make a voice recording. In order to avoid bias introduced by recording actual voice use, students estimated

their total voice use on a scale from one to five before leaving this instruction session. This judgment was included at the bottom of the consent form.

The students were given a voice log (Appendix B) on which they were to record all voice use for a period of forty-eight hours. They were instructed to note the amount of voice use in five-minute increments for each hour. The student was to enter the estimated time under one of three categories: speaking, singing, and any other vocalization such as screaming or sobbing. A sample log was provided for clarification (Appendix B).

Subjects were interviewed immediately prior to the voice taping by a tester. This voice survey (Appendix C) briefly addressed factors that affect vocal functioning as documented in the previous literature in Chapter II. Areas targeted included general health and vocal health. In addition, since a lack of awareness of the voice has been suggested as a major contributor to vocal problems, subjects were asked to make a judgment as to whether they exhibited any voice disturbance at the time of taping. The tester asked each subject, "Do you currently have a voice disturbance?" If the student answered "yes", he was asked to describe the disturbance. The tester provided no definition, discussion, or example of a voice disturbance. In addition, no mention was made regarding the voice in speaking versus singing.

Voice Recording

Subjects were recorded within twenty-four hours of the time the voice log was completed. Each voice sample included the following: a prolonged /a/, counting from one to ten, thirty seconds of running speech, and the reading of the first paragraph of Fairbank's "Rainbow Passage" (Appendix D). Taping occurred in an audiometric suite (Transacoustics RS 143-B). A ReVox B77 tape recorder was located on a table in the test booth. An ElectroVoice 636 microphone was coupled to the recorder. A constant mouth-to-microphone distance of six inches was maintained for each subject. The speech stimuli were recorded on 1.0 millimeter polyester tape (Ampex 641). (1, 3, 6)

Each subject was seated at the table. Prior to the voice taping, the hearing screening was conducted. The individual was then given time to familiarize himself with the passage by reading it aloud. The microphone was placed in a stand and moved to a distance six inches from the subject's mouth. It was placed to one side in order to avoid air blasts.

The tester instructed the subject to monitor his voice output by watching the VU meter. During the recording, the VU meter was not allowed to deflect past 0 VU (1 volt/rms). If the subject was not able to regulate his voice in order to keep the needle of the VU meter within a desirable range, the tester stopped the taping and provided instruction. The

process was repeated until a satisfactory taping could be made. The subject was asked to produce a prolonged /a/, count from one to ten, and speak generally about himself for approximately thirty seconds. Finally, he read the paragraph. Suggestions for running speech were provided which did not reflect the individual's status as a singer or a non-singer.

Voice Rating

The voice samples were judged by three speech-language pathologists who hold the Clinical Certificate of Competence. (This certification represents compliance with professional standards as set by the American Speech-Language and Hearing Association.) All ratings were made independently. Prior to judging, a brief training period was conducted for the three judges in which the Frank Wilson voice tapes were utilized to establish a common criteria for a deviation in voice quality or production. The judges replayed the tapes until all three agreed on judgments regarding the vocal quality of these voice samples.

The taped voice samples were presented to the judges on a ReVox B77 tape recorder connected to an loudspeaker. The stimuli were presented in a quiet room. Judges were seated in a semi-circle approximately ten feet from the speaker. Each judge was provided a score sheet (Appendix E) on which

to record a decision as to whether the voice presented exhibited a deviation from normal in voice quality or production. No decision was made as to the degree of the deviation from normal. Criteria for determining normal voice quality and production were those which the speech-language pathologists would use in screening a normal population for a voice disorder; criteria were not made more stringent, as in dealing with a special voice-dependent population such as singers. A subject was considered to exhibit a voice disturbance if at least two of the three judges rated the voice as having a disturbance.

Ten voice samples were randomly selected and utilized to measure intrajudge reliability. These samples were copied onto a tape in random order and were presented at the end of the listening task. Interjudge and intrajudge reliability was calculated using percentage of agreement. The ratings of each pair of judges was examined for agreement, and an overall agreement among the three was determined.

Analysis

Three sets of information were available for analysis and comparison in this investigation: the time estimate of voice use in minutes on the voice log, the voice survey (including judgments of voice use and voice disturbances), and the voice evaluations made by the three certified

speech-language pathologists. From this information, the following data was obtained for each subject:

1. amount of total voice use,
2. amount of speaking time,
3. amount of singing time,
4. amount of other vocalization,
5. general health and vocal health information,
6. self-judgment of voice use,
7. self-judgment of voice disturbances, and
8. listeners' judgments of the subject's voice quality and production.

Subjects were divided into subject groups: non-singers, singers with fewer than three years study at the university level, and singers with three or more years study at the university level. (The singer groups will hereafter be referred to as less experienced and more experienced.) These groups were further divided into voice disturbance groups: those judged to have a voice disturbance and those judged not to have one. Means of voice use were calculated for the three subject groups, for the two voice disturbance groups, and for the six subgroups. An analysis of variance (ANOVA) with a 3 x 2 factorial design was utilized to determine the existence of any effects among the following factors: the average voice use for the three subject groups, the average voice use for the two voice disturbance groups, and any interplay between

these two (2, 4). An ANOVA was run for total voice use. Two additional ANOVA were run: one each for speaking use, and singing use. The data gathered as a result were incorporated using the format shown in Figure 1.

FIGURE 1.

ANOVA for Effects Between Voice Use and Voice Disturbances

Subject	Voice Disturbance	No Voice Disturbance	Subject Group Mean
Non-singers			
Singers (less than three years of study)			
Singers (three years of study or more)			

The incidence of voice disturbances observed in this study were compared to the expected incidence figure documented for a normal adult population (1). In addition, a Chi Square test was utilized to determine the existence of a relationship between voice disturbances observed and the three subject groups. The format in Figure 2 was used.

FIGURE 2.

Chi Square for Relationship Between Voice
Disturbances and Subject Groups

Subjects	Voice Disturbance	No Disturbance
Non-singers		
Singers (fewer than three years of study)		
Singers (three years of study or more)		
Total		

The accuracy of the subjects' perception of total voice use was calculated in the following manner. Since no previous data existed concerning average voice use, the range of use reported in this study was used as a reference. It was divided into equal parts to correspond with the five point scale utilized for the subject judgments. Each subject's judgment and actual voice use was compared to note an accurate perception of his use, an underestimation, or an overestimation. A Chi Square test was used to determine any relationship between accurate perception of voice use and the three groups using the format in Figure 3.

FIGURE 3.

Chi Square for Relationship Between Perception
of Voice Use and Subject Group

Subjects	Correct Judgment	Incorrect Judgment
Non-singers		
Singers (fewer than three years of study)		
Singers (three years of study or more)		

An examination of correct perception of voice
disturbances per group was also made using this test using
the format in Figure 4.

FIGURE 4.

Chi Square for Relationship Between Correct Perception
of Voice Disturbances and Subject Groups

Subjects	Correct Judgment	Incorrect Judgment
Non-singers		
Singers (fewer than three years of study)		
Singers (three years of study or more)		

All subjects judged to have a voice disturbance were divided into subject groups. These groups were further divided into those subjects who judged themselves to have a disturbance and those who did not. The Chi Square test was utilized to determine any relationship between correct judgments and subject groups.

Further pattern analysis was made by visual inspection of the actual data and comparisons among the three groups. Unusual trends involving general health information, vocal health information, inaccurate judgments of voice use and disturbances, and other vocalization were noted.

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CHAPTER IV

RESULTS

Subjects

An initial instruction session was conducted in which the purposes and procedures of the study were explained. In response to this session, one-hundred thirty-five students signed consent forms for participation in this investigation. Of these, sixty-three subjects completed all phases of the study, including the voice log, the voice survey, and the voice taping. The breakdown of the subjects according to groups and sex within the groups is illustrated in Table I.

TABLE I.
BREAKDOWN OF SUBJECTS BY GROUP AND SEX

Subjects	Male	Female	Total
Non-singers	6	10	16
Singers (fewer than three years of study)	9	16	25
Singers (three years of study or more)	9	13	22

Voice Use and Disturbances

Voice use totals were calculated from the voice log for each subject. The totals over the forty-eight hour period were used to make all calculations. Total voice use, speaking use, and singing use were calculated in minutes. Means (\bar{X}) in these three categories were calculated for each subject group (non-singers, less experienced singers, and more experienced singers) as were the standard deviations (SD). Table II illustrates the great variability encountered within all three subject groups.

TABLE II.
MEANS AND STANDARD DEVIATION OF VOICE USE IN MINUTES

Subjects	Total Voice Use		Speaking Use		Singing Use		Other Use	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Non-singers	400	187	369	165	17	26	14	32
Singers (fewer than three years of study)	716	210	468	167	231	129	17	27
Singers (three years of study or more)	658	198	398	160	253	103	7	17

Thirty-two of the sixty-three subjects listed some type of "other" vocalization (other than speaking or singing).

Only nine of these thirty-two described the vocalization. Three of these listed yelling and five listed laughing as an explanation. One listed whispering as the other vocalization. The remaining twenty-three subjects did not explain what their "other" vocalization entailed. Only four subjects had totals of voice use in this category that exceeded fifty minutes over the forty-eight hour period. The majority of the subjects reporting "other" vocalization had totals that ranged from five to twenty minutes over the forty-eight hour period.

In addition to means which represented all subjects, means were calculated for each group, shown in Table III, by eliminating the scores of those subjects who reported their voice use twenty-four hours prior to the voice taping to be atypical.

TABLE III.
OVERALL AND TYPICAL VOICE USE MEANS IN MINUTES

Subjects	Overall		"Typical Use"	
	Means	Number	Means	Number
Non-singers	400	16	391	14
Singers (fewer than three years of study)	716	25	691	16
Singers (three years of study or more)	658	22	664	12

A comparison of the voice use mean for all subjects in each group and the mean for only those subjects in each group who reported "typical use" was made by visual inspection. This revealed no substantial difference between means. Therefore, all scores were used to make the calculations in this study. Table III indicates both the overall and the "typical use" means for each group. Two non-singers reported atypical voice use; both reported less than the normal amount of use. Nine of the singers with less experience reported atypical voice use, four reporting it to be less than normal and five reporting it to be greater than normal. Ten of the singers with more experience reported atypical voice use, four reporting their use to be less than normal and six reporting it to be greater than normal.

An analysis of variance (ANOVA) with a 3 x 2 factorial design was utilized to determine significant differences and any effect among the following factors: mean voice use for the subject groups, mean voice use for the voice disturbance groups, and any interplay between these two (1, 2). An ANOVA was run for each of the voice use categories: total voice use, speaking use, and singing use. The means of voice use for the three subject groups, the two voice disturbance groups, and their six subgroups are listed in Table IV for each type of voice use.

TABLE IV
MEANS OF VOICE USE IN MINUTES BY SUBJECT GROUPS
AND VOICE DISTURBANCE GROUPS

Subject Groups	Voice Disturbance		No Voice Disturbance		Subject Group Mean	
	\bar{X}	N	\bar{X}	N	\bar{X}	N
Total Voice Use						
Non-singers	443	6	374	10	400	16
Singers (fewer than three years of study)	894	7	647	18	716	25
Singers (three years of study or more)	617	9	686	13	658	22
Voice Disturbance Group Mean	658	22	593	41	. . .	
Speaking Use						
Non-singers	401	6	351	10	369	16
Singers (fewer than three years of study)	571	7	429	18	468	25
Singers (three years of study or more)	337	9	440	13	398	22
Voice Disturbance Group Mean	429	22	413	41	. . .	
Singing Use						
Non-singers	18	6	17	10	17	16
Singers (fewer than three years of study)	306	7	202	18	231	25
Singers (three years of study or more)	275	9	237	13	253	22
Voice Disturbance Group Mean	215	22	168	41	. . .	

The ANOVA revealed significant differences between the subject groups and amount of voice use in minutes. This difference was significant at the $p < .05$ level for speaking use, at the $p < .01$ level for total voice use, and at the $p < .001$ level for singing use. Table V illustrates these results.

TABLE V.
SIGNIFICANT DIFFERENCES BETWEEN SUBJECT GROUPS
AND VOICE USE TOTALS IN MINUTES

Subjects	Total Use	Speaking Use	Singing Use
Non-singers	400	369	17
Singers (fewer than three years of study)	716	468	231
Singers (three years of study or more)	658	398	253
Degrees of Freedom	2,57	2,57	2,57
F Ratio Needed	4.98 (p.01)	3.15 (p.05)	7.76 (p.001)
F Ratio Calculated	6.36	3.20	32.78

A post-hoc comparison was done utilizing the Newman-Keuls test to determine where the specific differences lie

(20). This test, however, did not reveal where the significant differences revealed by the ANOVA lie. The unequal number of subjects among groups was judged to be responsible for the failure of this test to highlight differences. A visual inspection of Table 5 suggests the following differences between groups:

- 1) a significant difference in total voice use between singers and non-singers,

- 2) a significant difference in speaking use between less experienced singers and non-singers, and

- 3) a significant difference in singing use between singers and non-singers.

Under visual inspection, differences did not appear to lie between less experienced and more experienced singers. This appeared to be true in each of the three voice use categories. In addition, there appears to be no difference in speaking use between more the experienced singers' group and the non-singers group.

A second ANOVA was utilized to determine if any relationship existed between voice problems observed and voice use in each of the three use categories. No significance was found. There was no significant interplay noted between the following variables: subject groups, voice disturbance groups, and the means for each of these groups across the use categories of total use, speaking use, and singing use. Table VI indicates these data.

TABLE VI.
THE EFFECT OF VOICE USE IN MINUTES ON VOICE DISTURBANCES

Voice Disturbances	Total Use	Speaking Use	Singing Use
Voice Disturbance	658	429	215
No Disturbance	593	413	168
Degrees of Freedom	1,57	1,57	1,57
F Ratio Needed (p.05)	4.00	4.00	4.00
F Ratio Calculated	.95	.45	2.97

The incidence of voice disturbances observed per subject group is illustrated in Table VII.

TABLE VII.
INCIDENCE OF VOICE DISTURBANCES BY SUBJECT GROUP

Voice Disturbance	Non-singers	Singers (fewer than three years study)	Singers (three years of study or more)
Voice Disturbance	6	7	9
No Disturbance	10	18	13

Degrees of Freedom 2
Chi Square Needed (p.05) 5.99
Chi Square Calculated .92

A Chi Square test was used to determine any relationship. The test suggests that voice disturbances and the subject groups are independent of one another.

While there was no significant difference among the three groups, there was a high incidence of voice disturbances within the population studied in this investigation. The incidence noted was thirty-five percent. This compares with a one to two percent incidence documented for a normal adult population (1) and a fifty-seven percent incidence documented for university voice performance and pedagogy majors (2).

Awareness of Voice Use and Disturbances

The accuracy of each subject's judgment of total voice use was determined in the following manner. A five point scale of total voice use was utilized, a score of one representing very little use, a score of three a moderate amount of use, and a score of five very much use. All subjects rated themselves with scores of three, four, or five. None chose scores of one or two. The voice use reported by all subjects in the study ranged from 195 to 1105 minutes. This range was divided into three parts in order to correspond with the three categories chosen by the subjects in judging their voice use. The following ranges were used: 195-498, 499-802, and 803-1106 (this upper limit was extended by one point to make the ranges equal).

Table VIII presents the number of subjects in each group who accurately predicted their actual voice use.

TABLE VIII.
RELATIONSHIP BETWEEN SUBJECT GROUP AND ACCURACY
OF JUDGING AMOUNT OF VOICE USE

Subjects	No Adjustment	10% Adjustment	16% Adjustment
Non-singers	10	12	13
Singers (fewer than three years of study)	12	14	16
Singers (three years of study or more)	8	9	9
Degrees of Freedom	2	2	2
Chi Square Needed (p.05)	5.99	5.99	5.99
Chi Square Calculated	2.54	4.36	6.53

Each subject's judgment was analyzed to determine whether the subject had accurately predicted, underestimated, or overestimated his actual voice use when compared with the other subjects in the study. These group ranges represent arbitrary limits. Therefore two grouping

adjustments were also applied to the data to allow for a limited error range in assessing the subjects' accuracy. The first grouping adjustment allowed the individual's judgment to be within thirty minutes of his correct range or group. The arbitrary number of thirty minutes was chosen representing ten percent of the range. The second grouping adjustment allowed the individual's judgment to be within fifty minutes of his correct range. Fifty minutes represented sixteen percent of the range. The table presents three sets of numbers, corresponding to the three range criteria (no adjustment, ten percent adjustment, sixteen percent adjustment) discussed above. A Chi Square was calculated for each set of numbers.

Significance was found only with the sixteen percent correction. In this case, the non-singer group demonstrated greater accuracy in estimating voice use than either singer group. Those subjects whose judgments of amount of voice use were inaccurate were examined by subject group. Five of six non-singers underestimated their use; eight of thirteen less experienced singers overestimated their use; and twelve of fourteen more experienced singers overestimated their use.

Awareness of voice disturbances was approached in two ways. The first involved all subjects who were judged to exhibit voice disturbances at the time of the taping. These were divided into subject groups. They were further divided

into two groups: those who had judged themselves to have a disturbance and those who had not. A Chi Square test was utilized to note any relationship between greater awareness as measured by correct judgment and the subject groups. The results listed in Table IX suggest that these variables are independent of one another.

TABLE IX.
RELATIONSHIP BETWEEN SUBJECT GROUP AND ACCURACY OF
PERCEIVING VOICE DISTURBANCES NOTED BY JUDGES

Subject Perception	Non-singers	Singers (fewer than three years of study)	Singers (three years of study or more)
Disturbance Perceived	0	1	2
Not Perceived	6	6	7
Degrees of Freedom	2		
Chi Square Needed (p.05)	5.99		
Chi Square Calculated	1.51		

The second examination of the subjects' awareness involved those subjects who had judged themselves to have

voice disturbances. These were then divided into subject groups. These groups were further divided into two groups: those subjects who had exhibited voice disturbances and those who had not. The numbers are small, but one interesting thing may be noted. A greater number of less experienced singers judged themselves to have voice disturbances when none were noted. Table X illustrates this.

TABLE X.
ACCURACY OF SUBJECTS PERCEIVING THEMSELVES
TO HAVE VOICE DISTURBANCES

Disturbance noted by judges	Non-singers	Singers (fewer than three years of study)	Singers (three years of study or more)
Disturbance Present	0	1	2
Disturbance Absent	1	5	1

Data from the voice survey regarding general and vocal health was examined to note any trends. Subjects made judgments as to the amount of stress they were under at the time of the voice taping. There were no trends noted between these judgments and voice use or voice disturbances. In addition, there were no trends noted between voice use or

disturbances and allergies, menstrual cycles, smoking, or medications. The numbers of these cases, however, were very small and cannot represent true comparisons.

Reliability

The three speech-language pathologists made judgments as to whether each subject exhibited a voice disturbance at the time of the voice taping. The number of cases agreed upon by all three judges and by each pair of judges was calculated. A percentage figure was then calculated. The following table (Table XI) indicates this agreement and the number of disturbances observed.

TABLE XI.
AGREEMENT AMONG JUDGES OF VOICE
DISTURBANCES NOTED

Judges	Percentage Agreement	Number of Disturbances
A/B	77%	14
A/C	68%	15
B/C	71%	14
A/B/C	59%	10

A reliability check was conducted for each judge. Ten voice samples were judged a second time for this purpose. The percentage of intrajudge agreement was seventy percent

for Judge A, one hundred percent for Judge B, and eighty percent for Judge C. An examination of these individual differences in judgment revealed no change in the overall judgment of voice disturbances for the ten samples.

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CHAPTER V

DISCUSSION

This study was undertaken in order to determine the amount and type of voice use, voice disturbances, and awareness of these two factors in university voice students as compared with a non-singer population. In addition, singers with less experience were contrasted with more experienced singers in the same areas. The results obtained revealed few of the differences between singers and non-singers and none of the differences between less experienced and more experienced singers that were hypothesized. The following discussion examines the hypotheses which were tested in light of these results.

Voice Use

Hypotheses were formulated based on the assumption that singers would use their voices more than non-singers. The underlying assumption was that this would stem from their extra voice use in singing, speaking use being essentially constant. Hypothesis I postulated greater total voice use in singers than in non-singers. A significant difference was detected by an analysis of variance (ANOVA) at the $p < .01$ level; therefore, this hypothesis was accepted. Hypothesis III, which indicated greater singing use for

singers than non-singers, was also accepted with significance noted at the $p < .001$ level (3).

Hypothesis V proposed no difference between singers and non-singers in the area of speaking use. An ANOVA revealed a significant difference at the $p < .05$ level between groups. The null hypothesis was therefore rejected. A Newman-Keuls post hoc comparison (3) did not provide specific information regarding these differences. Informal observation of the data suggests that both groups of singers exhibited greater total voice use and greater singing use than non-singers but that only the less experienced singers exhibited a significantly greater amount of speaking use than non-singers.

Specific hypotheses were formulated based on the assumption that singers with more experience would modify their voice use in response to the increased vocal demand placed upon them due to regular singing in addition to speaking. The underlying assumption was that experience would provide mature judgment regarding conservation in voice use in order to ensure the best voice over time. Additionally, this conservation was anticipated in voice use in both singing and speaking. Hypothesis II postulated greater total voice use in less experienced singers than in more experienced singers; hypothesis IV proposed greater singing use in less experienced singers than in more experienced singers; and hypothesis VI proposed greater

speaking use in less experienced singers than in more experienced singers. Informal observation of the means in each of these three categories suggests that the significance detected by the ANOVA was not between the two singer groups; therefore, these three hypotheses were rejected.

It may be that the criterion used in this study (less than three years of university voice study and greater than or equal to three years of university voice study) does not accurately reflect increased experience. In this case, the anticipated differences might be noted between these students and older singers with more experience. It may also be that those students who have studied voice longer are those students whose vocal mechanisms naturally have more endurance. If this is the case, their voices have stood the test of additional voice use, and conservation may not be a necessary response for them.

Special notice should be taken of the variability of voice use encountered. Variability was great for each of the three subject groups in every use category (total voice use, speaking use, and singing use). This highlights the highly individual nature of voice use. Various factors may be operating. Demands made upon the student's use of his voice may vary according to specific programming at the university and elsewhere (such as in a church choir). The individual's response to these demands may also vary; some

may make adjustments for increased voice demand while others may simply increase their voice use. Personalities and interests affect choices regarding voice use during the individual's spare time. In addition, the inherent endurance and strength of the vocal mechanism is different for each person.

Voice Disturbances

Hypotheses about voice disturbances were made based on the assumptions of voice use listed above. Since the assumption was made that singers would exhibit greater voice use than non-singers, it was anticipated that singers would exhibit more voice disturbances than non-singers. Hypothesis VII proposed this. An ANOVA revealed no significant effect between voice disturbances and subject groups. This hypothesis was therefore rejected.

The assumption was also made that less experienced singers would exhibit greater voice use than more experienced singers. In addition, the assumption was made that less experienced singers might have a less efficient technique for vocalization than singers with more experience, which would make voice disturbances more likely even with the same amount of voice use. Hypothesis VIII postulated that less experienced singers would exhibit more voice disturbances than more experienced singers. As mentioned above, an ANOVA revealed no effect between voice

disturbances and subject groups, so this hypothesis was rejected.

It should be noted that, although there were no significant differences between groups, the overall incidence of voice disturbances in this study was much greater than the expected figure for a normal adult population as documented in the literature. The expected incidence is one to two percent (1). The incidence noted in this study was thirty-five percent. This elevated figure appears to confirm the higher incidence documented by Galloway and Berry (4). They studied vocal performance and pedagogy majors at the university level. It may be that university students as a group exhibit a higher incidence of voice disturbances than the normal population previously studied. It may also be that singers do indeed exhibit a greater number of voice disturbances than non-singers when examined outside of the university population.

Awareness of Voice Use and Disturbances

Hypotheses were formulated based on the assumption that singers would exhibit greater awareness of their voices as measured by accuracy in judging disturbances and amount of use than non-singers. It was assumed that this would be a result of their concentrated efforts in training, using, and evaluating their voices in singing. In addition, the assumption was made that singers with more experience would

exhibit a corresponding increase in this awareness. Hypothesis IX postulated that singers would exhibit a greater awareness of voice use as measured by accuracy in judging amount of voice use than non-singers. Hypothesis X proposed that more experienced singers would exhibit a greater awareness of voice use than less experienced singers. A Chi Square test revealed no significant differences among the groups when rigid limits were utilized. When adjustments were made to allow for a limited error range in assessing the subjects' accuracy in predicting voice use compared to others, significance was noted. The greater awareness noted here, however, was on the part of non-singers.

Trends among those subjects who did not accurately predict their voice use may help to explain this. Five of the six non-singers underestimated their voice use while twenty of the twenty-seven singers overestimated their voice use. Eight of the thirteen less experienced singers overestimated their voice use while twelve of the fourteen more experienced singers overestimated their voice use. It may be that these students have developed an awareness of their voice use as something specialized but they have not developed a sense of perspective regarding their use compared to that of others. Since concentrated effort is spent on improving the quality of vocalization, they may assume that the quantity of vocalization is greater.

It may also be that individuals rated themselves as using their voices more than usual when they, in fact, had responded to increased vocal demand by reducing vocalization. In other words, it is possible that some voice students rated what they felt the demand on their voices to be rather than their actual voice use. It may also be that singers rated their usual voice use and that the forty-eight hours documented for this study were not representative of their typical use. However, subjects were asked whether their voice use during this time was typical, and there were no observed differences between those who reported that it was and those who reported that it was not.

Hypotheses were formulated regarding the subjects' awareness of voice disturbances. These were based on the assumptions listed above: that singers would exhibit greater awareness of their voices than non-singers and that more experienced singers would exhibit greater awareness of their voices than less experienced singers. Hypothesis XI postulated that singers would exhibit a greater awareness of their voices as measured by accuracy in judging disturbances than non-singers. Hypothesis XII postulated that more experienced singers would exhibit a greater awareness of their voices as measured by accuracy in judging disturbances than less experienced singers.

The first comparison was done among subjects who were judged by the three speech-language pathologists to have

voice disturbances. These individuals were divided into groups within each subject group: those who had correctly judged themselves to have a disturbance and those who had not. A Chi Square test revealed no significant relationship between subject groups and awareness of voice disturbances. Therefore, both hypotheses were rejected.

A second examination of awareness was conducted. This involved those subjects who had judged themselves to have a voice disturbance. The individuals were divided into two groups within the subject groups: those who actually exhibited voice disturbances and those who did not. One thing may be noted: five of the six less experienced singers who judged themselves to have voice disturbances did not in fact exhibit disturbances. It may be that these singers understand the need for awareness of their voices but that they have yet to develop mature judgment in this area. It may also be that these individuals were indeed responding accurately to kinesthetic information; they may have felt changes in their voices which were not yet reflected acoustically and therefore not rated by the judges as disturbances.

It should be noted that no clear definition of what constitutes a voice disturbance exists. Singers train to achieve a very fine response from the vocal mechanism during singing. Therefore, their expectations of the voice can be much more precise than those of the non-singer who uses his

voice only in speaking. As a result, singers are more likely to notice a slight change in the voice than non-singers. In addition, since their demands are greater, singers are more likely to judge a slight change in the voice as a disturbance than non-singers. These differences between singers and non-singers may have been responsible in part for some of the results of this investigation.

Implications for Future Research

The results of this investigation suggest the need for extensive research in the area of voice use. The network of factors which can affect vocal functioning in this area include: the amount and type of vocalization, individual thresholds for misuse, changes in the voice with use, voice disturbances, awareness of the amount of voice use, and awareness of changes in the voice with use and voice disturbances. Although some differences between singers and non-singers were noted, this preliminary study examined only a small number of individuals. Trends noted here may not accurately reflect trends in a larger population (either for singers and non-singers in general or for singers and non-singers in a university population). Nevertheless, specific implications for future research can be made.

In order for research to address the possibility of vocal overuse and the effects of overuse on singers, especially inexperienced singers, specific information

regarding what is typical use must be gathered. Research is needed to determine

- 1) typical voice use for non-singers, in general and at the university level,
- 2) typical voice use for singers in general and for singers pursuing voice study at the university level,
- 3) the effect of requirements for voice-related degrees upon students in terms of amount and type of voice use,
- 4) a comparison of this effect between undergraduate and graduate degrees.

Doctors, teachers, and singers generally agree that extended use of the voice affects changes in voice quality (2, 6). In light of this, exploration of these changes could prove beneficial. A significantly high incidence of voice disturbances was noted in the limited population of university students examined in this investigation. Further research should be conducted to determine

- 1) the incidence of voice disturbances in university students as compared with a normal population,
- 2) the existence of a relationship between voice disturbances and course of study (voice-dominant versus non voice-dominant majors as well as singers versus other voice-dominant majors), and

- 3) the existence of a relationship between voice disturbances and amount of experience in singers (within a university population as well as within a population of professional singers).

Awareness of the amount of voice use and any changes affected in the voice through this use is essential for the health of the vocal mechanism. There was no difference noted in the awareness of voice use and disturbances between singers and non-singers. If anything, non-singers demonstrated a more accurate perception of actual voice use. Trends noted in this study highlighted a tendency for singers to overestimate their voice use. Research with a larger sample is needed to determine

- 1) the accuracy of perception of the amount of voice use in non-singers, in general and at the university level,
- 2) the accuracy of perception of the amount of voice use in singers in general and in singers pursuing voice study at the university level,
- 3) the existence of a relationship between accurate perception of the amount of voice use and amount of experience in singers (within a university population as well as within a population of professional singers),
- 4) the self-awareness of voice disturbances in non-singers, in general and at the university level,

- 5) the self-awareness of voice disturbances in singers in general and in singers pursuing voice study at the university level, and
- 6) the existence of a relationship between awareness of voice disturbances and amount of experience in singers (within a university population as well as within a population of professional singers).

Implications for Clinical Management

Although no significant difference was found among the three subject groups for incidence of voice disturbances, the consistently high incidence rate in all three groups suggests a high level of voice disorders at North Texas State University. The observed incidence of thirty-five percent is much higher than the expected one to two percent (1). However, it is lower than the fifty-seven percent incidence noted by Galloway and Berry (4). They studied voice majors and suggested an especially high incidence of voice problems among university voice students. A specific conclusion regarding university voice students cannot be drawn from the results of this investigation, but it appears that university students in general may be more susceptible to voice disorders.

Prudent clinical management would suggest a routine voice screening of this population. Although the results of this study cannot provide reasons for this increase, the

presence of the problem cannot be denied. The low accuracy in estimating voice use and the presence of disturbances suggests the need for further education and training of the student in proper voice use. This is especially important for singers. A course of instruction emphasizing proper vocal hygiene and correct use of the voice in speaking and singing would be appropriate for the beginning voice student. An increase in awareness of voice disturbances and voice use might bring the incidence of voice disorders within the expected range.

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APPENDIX

APPENDIX A

RESEARCH CONSENT FORM

Name _____ Subject Number _____
Address _____
Phone number _____

I have agreed to participate in the research study which is described in the Instruction Sheet. This investigation is under the direction of Linda Dovalina, Dr. George Larson, and Laurel Miller. The purpose and procedures of this study have been explained to me. I have had the opportunity to ask questions, and I have received acceptable answers to these questions. I understand that the procedures are investigational and that I may withdraw my consent at any time during the investigation.

Signature _____
Date _____

Investigator _____

On a scale from 1 to 5, I use my voice

1	2	3	4	5
Very little		A moderate amount		Very much

APPENDIX B

Instruction Sheet

The purpose of this study is to gather information which will be helpful to people who depend upon their voices a great deal. This investigation focuses directly on singers. Your participation will contribute much. All people use their voices in some way every day. This study will examine the amount of voice use and the type of voice use typical for university students.

You will receive a voice log. For forty-eight hours, you will record how much you use your voice on this log. First, record the activity for the hour. Then, note how much you used your voice under each type of use: singing, speaking, and other. Other types of voice use might include screaming, shouting, or sobbing; any way in which you use your voice other than singing or speaking should be noted under this category. Record the amount of singing, speaking, or other vocalization you do in five-minute intervals. Estimate your vocalization carefully.

Before you leave the instruction session, you will be asked to answer a couple of questions. At that time, you will be given a list of times when you can make a voice recording. This recording will be done in the Speech and Drama Building. You will be recorded while you read a short

paragraph. This will take no longer than fifteen minutes. When the tapes are reviewed, your voice will be screened for possible voice problems. If anything out of the ordinary is noticed, you will be notified, and you may make an appointment for an in-depth voice evaluation at the North Texas State University Speech and Hearing Center.

This is a busy time of year for everyone. I realize that your time is precious and that everyone is demanding your best efforts. Let me express my great appreciation for your participation in this study. It is an effort which will indeed be useful to anyone who depends upon his voice.

Linda Dovalina

Masters Candidate in Speech-language Pathology

Voice Log

Name	Date	Number of Minutes		
Time	Activity	Speaking	Singing	Other
5-6				
6-7				
7-8				
8-9				
9-10				
10-11				
11-12				
12-1				
1-2				
2-3				
3-4				
4-5				
5-6				
6-7				
7-8				
8-9				
9-10				
10-11				
11-12				
12-1				

Sample Voice Log

Name:

Date:

Time	Activity	Number of Minutes		
		Speaking	Singing	Other
5-6	sleep	0	0	0
6-7	sleep	0	0	0
7-8	getting dressed	10	0	0
8-9	class	0	0	0
9-10	class	10	0	0
10-11	voice practice	0	45	0
11-12	voice lesson	15	45	0
12-1	lunch	30	0	0
1-2	study	0	0	0
2-3	choir	15	30	0
3-4	choir	0	45	0
4-5	voice class	10	5	0
5-6	dinner	15	0	0
6-7	at home	10	0	0
7-8	rehearsal	30	30	0
8-9	out with friends	30	0	5
9-10	talk on the phone	20	0	0
10-11	study	10	0	0
11-12	sleep	0	0	0
12-1	sleep	0	0	0

Voice Survey

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Are you currently in your menstrual period?

Do you have any medical problems?

If so, please describe.

Please list all current medications.

For what condition are you taking this medication?

Is this typical, seasonal, or temporary?

At this time, how much stress are you under? 1 2 3 4 5

VOICE

Is the last 24-hour period typical voice use for you?

If no, why?

In the last six months, how many times have you:

had a sore throat?

had sore neck and throat muscles?

found it hard to speak or sing?

become hoarse?

felt that your voice was tired or fatigued?

lost your voice?

Do you currently have a voice disturbance?

If yes, describe.

APPENDIX D

The Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for a pot of gold at the end of the rainbow.

APPENDIX E

Voice Rating Form

Subject Number	Voice Task	Voice Disturbance	
		Present	Absent
	Counting (1-10)		
	Running Speech		
	Reading Standardized Paragraph		
	Overall Voice Quality		

Rater's Initials

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