

Evaluating video journals as a tool for home voice practice of vocal hygiene

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Abstract

Extensive vocal hygiene behavior changes can be challenging for patients to achieve without accountability outside of treatment. Frequently clinicians rely upon patient report or voice journaling to track vocal hygiene behaviors between sessions. Use of technology, such as smartphone applications, has been shown to be effective in adherence to other voice exercises (van Leer & Porcaro, 2018). The use of video or audio journals to record vocal hygiene behaviors and complete self-assessments of related voice quality may be helpful for patients. This study compared two different modes of journaling, video journals and paper journals, to a no journal control group. Outcome measures included use of journal, use of vocal hygiene behaviors, changes to voice function, and participant perceptions.

Literature Review

Speech language pathologists, SLPs, are professionals that serve patients and their families/caregivers in both medical and educational settings. ASHA, the American Speech-Language Hearing Association, states: “Speech Language Pathologists work to prevent, assess, diagnosis and treat speech, language, social communication, cognitive communication, and swallowing disorders in children and adults” (American Speech-Language Hearing Association, n.d.). SLPs work to treat disorders, alleviate symptoms, provide various supports, and help families/caregivers in understanding and coping with diagnoses that affect cognition, speech, language, or swallowing. The focus of the current study is the area of voice disorders.

The larynx, also known as the voice box, is located above the windpipe in the neck. The vocal folds are two pieces of tissue that are about at the level of the Adam’s Apple. The vocal folds are attached at the front and can open and close at the back. When breathing, they are in an open position. During phonation (talking), closure and vibration of the vocal folds occurs. The vibration is due to the airflow that is provided by the respiratory system. When all of these systems (respiratory, larynx, and upper airway of the pharynx, oral cavity, and nasal cavity) work appropriately, typical voice and speech occurs.

A voice disorder is diagnosed when an individual expresses concern about challenges relating to an abnormal voice, which does not allow him/her the ability to meet every-day needs (American Speech-Language Hearing Association, n.d.). Individuals with voice disorders can experience loss of voice, pain, difficulty with effective communication for everyday personal and professional interactions, fatigue, tension, and a myriad of other symptoms. Voice disorders can arise from organic sources such as nodules or polyps, neurological sources such as tremor or paralysis, or vocal abuse and/or misuse.

Hyperfunctional voice disorders are disorders seen when an organic or neurological vocal fold pathology cannot be identified. These can occur due to vocal misuse or abuse from excessive use, intensity of speaking, laryngeal tension, muscle compensation, and psychological factors (Oates, J., & Winkworth, A. 2008). Muscle Tension Dysphonia (MTD) is a common example of a hyperfunctional voice disorder in which the tension can prevent the voice from functioning properly. Tension can cause pain, fatigue, weakness, or voice change.

When seeking aid from an SLP, an assessment is conducted during the initial appointment to provide the SLP with adequate information to plan an appropriate direction for treatment. Components of the assessment conducted are clinician- client interview, where the SLP will gain knowledge about the symptoms the client is experiencing, the onset and duration of the problem, associated symptoms, and typical voice use. After that, perceptual and acoustic voice assessments and direct or indirect visualization of the vocal folds will also be performed. Information learned from the intake appointment aids in being able to properly choose follow-up assessments that will be beneficial in finding a diagnosis or to make a referral to a laryngologist (Ear, Nose, and Throat doctor, n.d.).

The clinical interview is typically the first step in any evaluation. It provides detailed information from the client's perspective about voice function. Clinicians may use rating scales, like the Voice Handicap Index (VHI) (Jacobson et al, 1997) or Voice Related Quality of Life (V-RQOL) (Hogikyan & Sethuraman) to gain an objective assessment of how the voice impacts the client's daily life.

After completing the clinical interview, the clinician will do a perceptual evaluation. This involves careful listening to the various aspects of the client's voice and documenting severity using a scale, such as the Consensus Auditory Perceptual Evaluation of Voice (CAPE-

V) (Kempster et al., 2009) or Grade Roughness Breathiness Asthenia Strain Scale (GRBAS) (Hirano, 1981). Clients perform a variety of tasks like sustained phonation, reading sentences, and providing spontaneous speech samples.

Acoustic or aerodynamic measurements reflect the sounds and airflow energies as the vocal folds vibrate. This includes fundamental frequency, which is the acoustic measure that reflects the rate of vibration of the vocal folds, measured from a sustained vowel. Other measures, like jitter, shimmer, and harmonic to noise ratio help quantify the periodicity of vibration and extent of closure, both of which are needed for good voice quality. Phonation range, the frequencies from the highest to lowest that the patient is able to produce, is another useful measure taken to document the client's ability to stretch and contract the vocal folds. Dynamic range tasks require the client to produce the softest /ah/ and then produce the loudest /ah/ possible to assess the coordination of the respiratory and laryngeal function as well as the size of the vocal fold vibration. The clinician may have the patient produce a maximum phonation time task, which requires the patient to hold out a vowel sound /ah/ at a comfortable pitch for as long as possible. This task assesses both respiratory support and the efficiency of the vocal fold vibration.

Visual assessment of the vocal folds includes directly observing the vocal folds through oral or nasal endoscopes or indirectly using a mirror exam. Oral or nasal endoscopy includes using a camera attached to a scope that gives the ability to see the vocal folds in motion. This is important as SLPs can look at the closure pattern of the vocal folds, vibration of the folds, any growths/lesions, color of the structures, squeezing of the structures, etc. Results of the visualization may guide treatment planning to change anatomy or physiology of the larynx as needed.

Treatment can vary based on the type of the voice disorder. Treatment options range from implementation and change of behaviors for better quality voice to medical and/or surgical treatments. Surgery is the most invasive treatment as it involves cutting into tissues, which can alter the tissues and the shape or position of the structures surrounding the vocal folds. Surgery is usually chosen in cases to remove lesions, modify the position or shape of the vocal fold, or even inject and implant materials. “The goals of surgical management are to conserve, reconstruct, or improve laryngeal functions—phonation, swallowing, and respiration” (Colton, R. H., Casper, J. K., & Leonard, R. (2012).

Voice therapy may be determined to be the best option for treatment. Speech-language pathologists are often called upon to provide treatment to regain healthy voice and adequate function. SLPs use different approaches for treatment, which can be classified as direct treatment and indirect treatment. Direct treatment is an option that attempts to directly change the vocal mechanism, while indirect treatment modifies cognitive, behavioral, psychological, and physical environments.

Direct treatment techniques, like resonant voice therapy (Resonance Disorders), Casper Stone flow phonation (American Speech-Language Association, n.d.), circumlaryngeal massage, or muscle tension reduction exercises, require the client to alter the function of the vocal mechanism. Resonant voice therapy and Casper Stone flow phonation require the individual to produce oral vibratory sensations in the face for easier vibration of the vocal folds; they are designed to directly change the amount of adduction of the vocal folds. Circumlaryngeal massage and muscle tension reduction exercises are techniques that are used to reduce the excessive tension in the neck and laryngeal muscles; this can directly alter the type and amount of squeezing of the vocal folds for phonation. Many other direct treatments exist.

Indirect therapy techniques, like altering the environment in which the client speaks, require the client to change aspects of how the voice is used. In cases where a voice disorder develops due to the way a person uses his/her voice (or misuses his/her voice), treatment by an SLP often requires training the patient in healthy vocal behaviors. Vocal hygiene is more specifically a habit that supports a healthy and strong voice. Some healthy vocal hygiene habits include increased hydration, avoiding alcohol and smoking, reduced intake of spicy foods, awareness of throat clearing, and controlling loudness (Ear, Nose, Throat Consultants, n.d.). Permanent damage to the voice is possible with prolonged poor vocal hygiene.

Although there are many aspects of vocal hygiene, this study focused on three habits: reduction of loud talking and yelling, reduction of throat clearing, and vocal rest. These are important to vocal hygiene as loud talking and yelling or throat clearing can cause trauma or strain to the vocal folds. Vocal rest is also important as it allows the tissues to rest from the vibration created due to talking. Constant use and especially misuse could cause vocal strain, excessive tension, and even vocal nodules.

Previous research has suggested that vocal hygiene may contribute to reduced perception of vocal handicap (Behrman, Rutledge, Hembree, & Sheridan, 2008), improved acoustic measures of voice function (Chan, 1994), improved voice quality (Verdolini-Marston, et al., 1994), and improved measures of effort in voicing (Verdolini-Marston, et al., 1994). However, training in vocal hygiene, without daily behavior tracking, does not result in changes to most voice measures (Broaddus-Lawrence, et al., 2000). In one study, individuals who adhered to a regimen of vocal hygiene behavior showed significant improvements in perceived voice function as compared to those who reported that they did not adhere to the treatment plan (Behrman, Rutledge, Hembree, & Sheridan, 2008).

Patients may find it challenging to comply with an extensive list of recommendations and behavior changes, specifically when no accountability is required (Broaddus-Lawrence, et al., 2000). Current practice within speech-language pathology utilizes patient self-report about the adherence to vocal hygiene recommendations, either with or without written supports such as a voice journal (Broaddus-Lawrence, et al., 2000; Chan, 1994). Use of technology, such as smartphone applications, has been proposed and shown to be effective in adherence to other voice exercises (van Leer & Porcaro, 2018). However, to date, no studies have examined the use of voice or audio journals to record self-assessments of adherence to vocal hygiene recommendations. The immediacy, effectiveness, and reflective nature of video recordings may contribute to better adherence and overall improvements (Aitken & Deaker, 2007). This study will examine the benefits to different modes of journaling and find whether or not it increases patient compliance to vocal hygiene behaviors.

The following research questions were developed:

1. Do participants use paper and video journals for documenting vocal hygiene with similar compliance?
2. Does a video journal help participants use positive vocal hygiene habits, as compared to paper or no journal use?
3. Does a video journal improve voice function, when using positive vocal hygiene habits, as compared to paper or no journal use?
4. Do participants rate their voice function differently after receiving vocal hygiene education and opportunities to practice?

Methods

Participants

Eleven students from the University of Wisconsin Eau Claire College of Education and Human Sciences were recruited to participate. The participants averaged 20.9 years (range 19-29 years). All participants were female; gender was not an inclusion/exclusion criterion. All participants reported no history of voice or speech disorders prior to beginning the study. The study was approved by the IRB at UW Eau Claire and all participants provided informed consent prior to beginning participation. Participants within each group were similar across measures.

Table 1

Participant demographics

Participant	Age	Stress Score (max of 5)	Daily Water Intake (avg. ounces)	Daily Caffeine Intake (avg. ounces)	Daily Voice Usage
P1	21	3.5	60	20	Loud talking at work and typical conv.
P2	20	4	16	8	Minimal; yelling at volleyball
P3	20	3	40	10	Typical conversation, singing, yelling
P4	21	3	60	4	School and social
Paper group average	20.5	3.4	44	10.5	
NJ1	21	3.5	60	0	Social, athletics and phone talking
NJ2	20	2	40	16	Social and work
NJ3	20	2	40	14	Work, school/educating
No Journal group average	20.3	2.5	46.7	10	
V1	19	2	25	0	Conversational
V2	21	4	80	4	Conversational
V3	18	3	32	16	Work and social
V4	29	2	40	24	Work related
Video group average	21.8	2.8	44.3	11	
Overall	20.9	2.9	44.8	10.6	

Procedure

Participants were randomly assigned to one of three groups: 1) no journaling, where the participant reported vocal hygiene behaviors weekly during a meeting with the primary investigator; 2) paper journaling, where the participant recorded vocal hygiene behaviors daily on a paper form and presented these to the PI weekly (Appendix A); 3) video journaling, where the participant recorded short “selfie” videos daily about vocal hygiene behaviors and presented these to the PI weekly. Each participant completed four visits. The first visit was an initial baseline evaluation. The second and third visits were meetings with the PI to share vocal hygiene behavior use; those in groups using journaling presented their journals at this time. The fourth visit was a final sharing of vocal hygiene behaviors, as well as a final voice evaluation.

Participants initially completed a brief evaluation session. Following informed consent documentation, participants completed a demographic questionnaire to get information about gender, age, voice history, and estimated vocal hygiene behavior implementation. The Voice Handicap Index was then administered to each participant. Recordings of the participants’ voices were completed in a sound-proof booth, using the Marantz Solid State Recorder PMD661 MK II. Participants provided sustained phonation, sustained /s/, sustained /z/, glides up and down, sentences from the CAPE-V, the Rainbow passage, and a 30-second monologue. Next, each participant received a stroboscopic exam to visualize the larynx, specifically the structure and vocal fold vibration. During the exam, participants completed the following: sustained phonation, gliding up and down, loud and soft phonation, and a laryngeal diadochokinesis task. Following the voice measures and stroboscopic exam, education was provided related to vocal hygiene, with special discussion of the three behaviors to be tracked in this study: 1) reduction in

loud talking/yelling; 2) reduction in throat clearing; 3) implementation of vocal rest. Finally, participants were trained in their assigned type of journaling (none, paper, or video).

Each week, participants focused on vocal hygiene habits and recorded data as assigned. Participants assigned to the no journal group were asked to be aware of their habits, but not to track any specific behaviors throughout the week. Participants assigned to the paper journal group were provided a folder with pre-typed questions to answer on a daily basis related to specific vocal hygiene behaviors. Participants assigned to the video journal group were provided an Apple 6th generation iPod to record brief video reflections on a daily basis related to specific vocal hygiene behaviors. Questions were provided for making their videos. Journal questions are provided in (Appendix A).

On a weekly basis, participants met with the PI and provided a brief reflection of the week overall, in terms of vocal hygiene use. Specifically, participants were asked to report use of intentional vocal rest, frequency of throat clearing, and frequency of loud talking/yelling on a three-point scale (none, some, lots). Then, participants were asked to report whether their awareness had changed, how their voice sounded, and whether the habits were affecting their voice. These responses were recorded by the PI; an example of this questionnaire is available in (Appendix C). The PI also collected the daily journals from the past week from the participants in the paper and video groups. At their final visit, each participant completed a follow-up questionnaire to reflect on their experience and then repeated the voice recordings and stroboscopic exam used in the baseline evaluation.

Data Analysis

Audio files were uploaded from the Marantz Solid State Recorder PMD661 MK II into the MDVP Advanced Version on the Model 4150B Computerized Speech Lab (CSL). Sustained

phonation samples were analyzed first, gathering F0, MaxF0, Min F0, SD F0, using the single token protocol for each phonation sample. Statistical data were listed in the MDVP Report: Voice Report. This report generated Average Fundamental frequency (mean F0), Jitter (RAP), Shimmer (APQ), and Noise to Harmonic Ratio (NHR). S to z ratio was calculated by timing the duration of the sustained /s/ and the sustained /z/ using the CSL. Next connected speech samples, including the CAPE-V Sentences, the Rainbow Passage, and a thirty-second monologue were analyzed under the single token protocol for fundamental frequency, phonatory F0 range (PFR), maximum and minimum fundamental frequency (fhi and flo), and also the Cepstral Peak Prominence (mean and standard deviation). Glides were analyzed for high and low frequency using the CSL.

Each file was saved as a wav audio file under the assigned number. For overall perceptual rating of the monologue, rainbow passage, sustained phonation, and CAPE-V sentences, the files were assembled into a playlist using PowerPoint with each participant using their assigned number. Each playlist contained both pre- and post-journaling files and repeated eight files for intra-rater reliability calculations. Two researchers rated the overall severity and noted any roughness, breathiness, or strain in each sample. The overall rating was on a 0 to 5 scale, with 0 being normal and 5 being severely abnormal. These ratings were selected to make a more precise decision compared to the typical 3-point, mild, moderate, severe scale. An example of the rating form is included in (Appendix D). The two listeners' ratings were averaged for each sample. Comparisons were made across groups and across individuals to determine whether change occurred over the course of the study.

Stroboscopic exams were viewed by the same two researchers to score closure pattern, vocal fold edge, supraglottic involvement, amplitude of vibration, and mucosal wave. These are

frequently measured characteristics of vocal fold movement and vibration during stroboscopic exams. Each characteristic was rated from 0-5, with zero showing none/normal and 5 showing severely abnormal function. An example of the rating form is included in (Appendix E). Change scores from pre to post were calculated, and comparisons were made within and across groups.

The VHI forms were scored for each subscale (i.e., physical, functional, emotional), as well as the total for each participant for the pre- and post-study assessments. Group means were calculated for comparison across the journal types.

Each participant's journal entries were recorded by date. The number of entries was counted and converted to a percentage based on the number of possible entries throughout the course of the study. Journal completion was compared between video and paper groups.

Vocal hygiene behaviors were also tracked based on journal entries submitted to the PI during the weekly meetings. Daily questions about voice rest, throat clearing, and loud talking were assigned a score and reported across the duration of the study for the paper and video groups. Weekly meeting responses related to voice rest, throat clearing behavior and awareness, and loud talking behavior and awareness were assigned a score and reported across the study's duration. Comparisons across groups were completed with a two-way ANOVA.

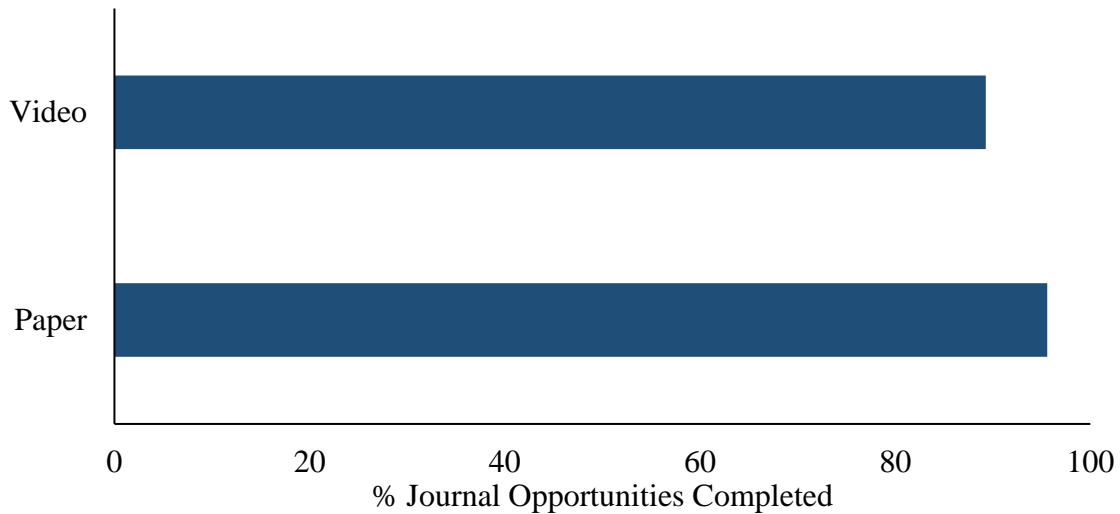
Results

Journal Compliance

Each participant in the paper and video groups had an opportunity to journal every day from their first to the last session (n=20-25 days; variability based on start and end dates for some participants). The paper journal group averaged a 95.6% completion rate while the video

Figure 1

Journal Completion by Group



journal group averaged an 89.3% completion rate (Figure 1). Three participants had 100% completion (two from the paper group and one from the video group). Of the remaining five participants, three had greater than 90% completion rates. Only one participant in each group had less than 90% completion.

Open-ended responses to questions about journal type and effectiveness during the participants' final session were recorded. Those who were in a no journal group felt that they had gained more awareness in vocal hygiene but lacked something to hold them accountable for implementing the habits. Participants in the paper journal group stated that their journal was easy to use due to the pre-typed questions. The physical journal served as a reminder to implement vocal hygiene practices and journal their experience. The video journaling group also felt that the journal was easy to use, and it was an efficient way to record their experience. Similar to the paper group, the video group emphasized that the iPod served as a

reminder to implement vocal hygiene habits and journal their experience. Neither group identified any major concerns with their journaling type, although one participant in the video journal group reported that recording the videos made her nervous.

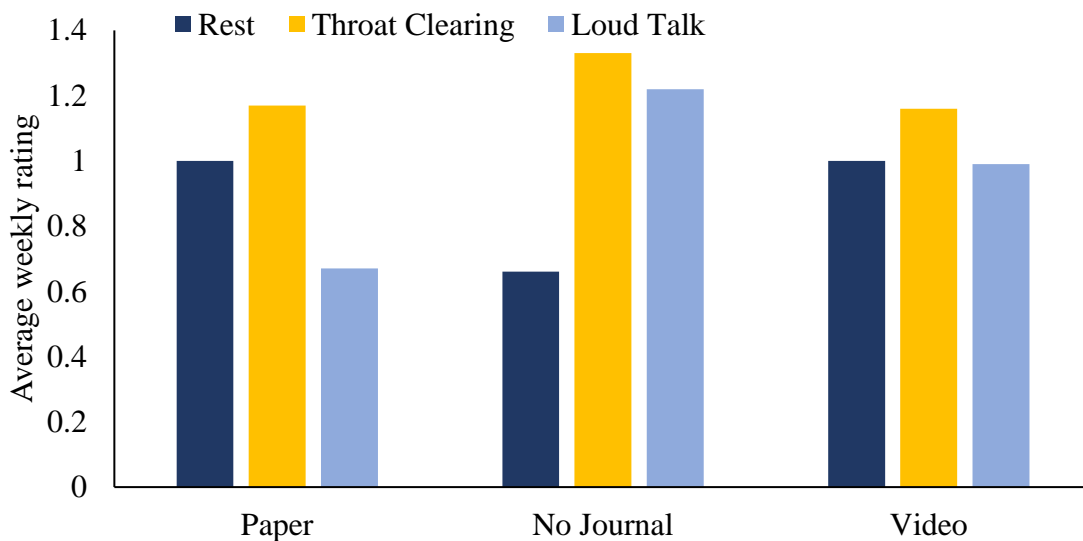
Use of Vocal Hygiene Habits

Figure 2 provides average vocal hygiene usage per week across each group. For the behavior of vocal rest, participants in the paper and video journal groups more consistently used this behavior than the no journal group. No statistically significant differences between groups, on the basis of vocal hygiene behavior usage, were found (two-way ANOVA for group and behaviors using Roy's Largest Root, $F=1.37$, $p=0.329$).

Further analysis of the day-to-day use of habits for participants in the video and paper groups was completed by plotting ratings of habit throughout the duration of the study. More

Figure 2

Vocal Hygiene Behavior Usage Between Groups



participants in the video group reported using the habit of reduced loud talking on a consistent basis (Figure 3); in the paper group, a larger number of participant responses indicated that they did not implement the habit of reduced loud talking at all (Figure 4). Only one participant in the video group did not implement the habit and that only occurred several times. In the paper group, three of the four participants had instances of not implementing the habit, with two of those having frequent days without implementation. Similar results were noted in the habit of throat clearing. In the video group, one participant reported not using the habit, and instances of occasionally performing loud talking were documented. (Figure 5). In the paper group, all four participants reported at least one instance of using throat clearing, although for this habit, most only reported use of the habit on 1-2 days (Figure 6).

Figure 3.

Use of Loud Talking (Talk) Over Time by Participants in the Paper Journal Group.

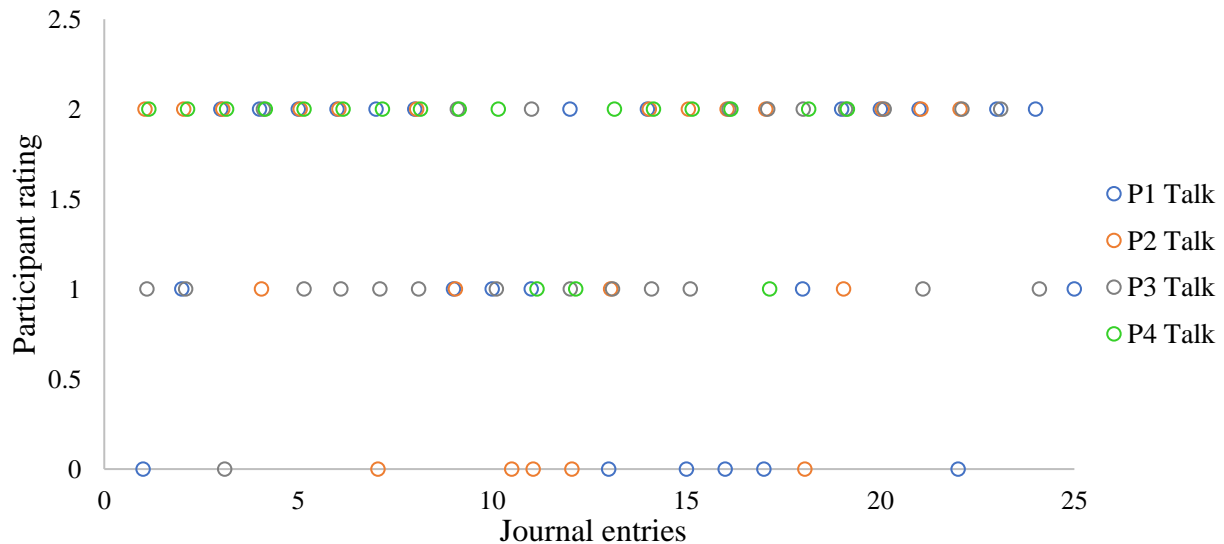


Figure 4.

Use of Loud Talking Over Time by Participants in the Video Journal Group.

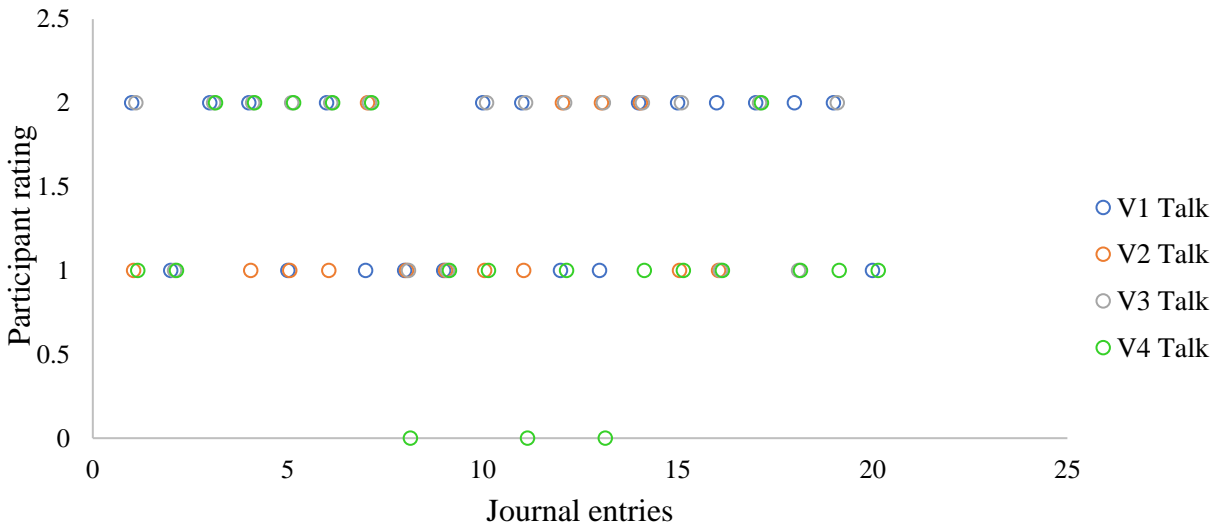


Figure 5.

Use of Throat Clearing (TC) Over Time by Participants in the Paper Journal Group.

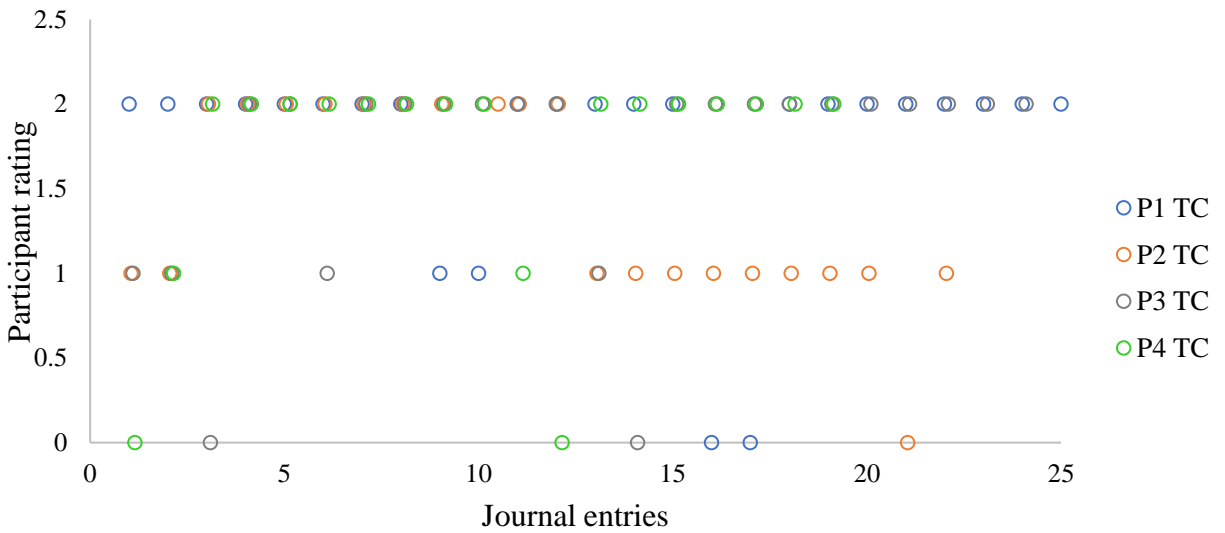
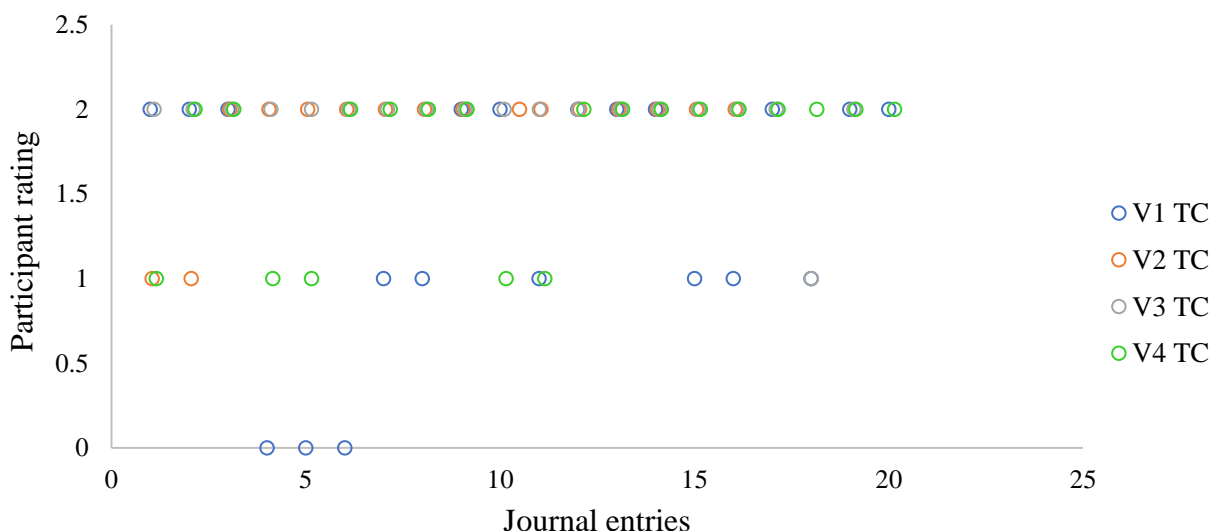


Figure 6.

Use of Throat Clearing Over Time by Participants in the Video Journal Group.



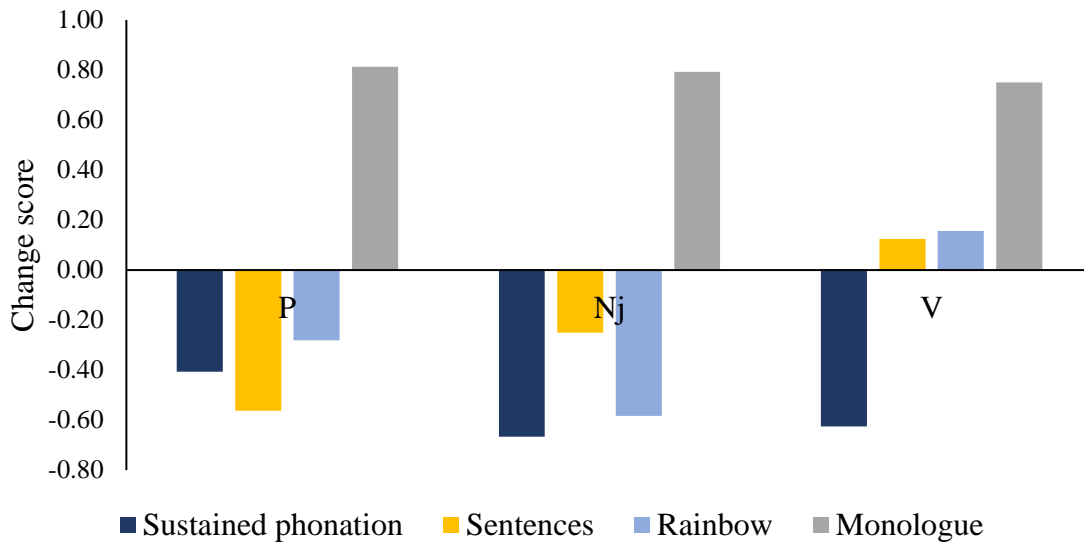
Overall, paper and video journal groups provided more consistent responses during their weekly check-ins to questions like: “did you feel more aware of your loud talking or throat clearing” and “did you intentionally rest your voice.” Although these groups were able to answer questions with greater confidence, all groups reported an increased awareness of vocal hygiene adherence. All groups reported implementation of these habits into their lives, but those without a journal reported that there was less of a change.

Vocal Function Changes

Figure 7 shows perceptual change scores across three different tasks; change scores were calculated by subtracting the pre-therapy rating from the post-therapy. For the perceptual ratings, a score of 1 indicated normal voicing while a score of 5 indicated severely impaired voicing; averages of the two judges were used. Thus, change scores that are negative are considered better or showing improvement. The scores ranged between one and two, as all participants enrolled in

Figure 7

Mean Perceptual Voice Rating Change Scores for All Groups



the study had self-reported normal voice function. All participants showed better vocal quality on sustained phonation at post-test; conversely, all participants showed poorer vocal quality at the post-test on the monologue.

Table 2 provides acoustic data as change scores for each group. For jitter, shimmer, and NHR, negative change scores indicate an improvement from pre-test to post-test. For PFR and CPP, positive change scores indicate an improvement from pre-test to post-test. For ease of reading Table 2, improved scores have been highlighted. Change scores, for all measures, are extremely small.

Ratings from the physical examination of the larynx using stroboscopy showed very little difference between pre-test and post-test. Scores range from 0 (normal) to 1 (slightly abnormal) across all five areas assessed. Most ratings, when averaged between the judges, were scored as zero at the pre-test and post-test. The stroboscopic exam showed that all participants were normal to start.

Table 2

Mean acoustic data for each group

Group	Jitter	Shim.	NHR	PFR sent.	CPP sent.	PFR Rain.	CPP Rain.	PFR mono.	CPP mono.
No journal	-0.15	-0.70	-0.01	-3.00	0.27	-1.33	-0.20	1.67	0.54
Paper	0.02	-0.47	0	-1.50	-0.05	1.00	-0.24	-5.00	-0.03
Video	0.12	-0.14	0	3.50	-0.49	-1.75	0.21	-0.50	0

(Shim. = shimmer; sent. = sentences; Rain. = Rainbow passage; mono. = monologue)

Quality of Life/Rating of Voice Function

The participants completed the Voice Handicap Index at the first and last session. Most individuals rated their voices better at post-test (see Figure 8). One participant in the video group had a slight increase in their rating.

Figure 8

Mean Average Rating of Voice Handicap Index for All Groups

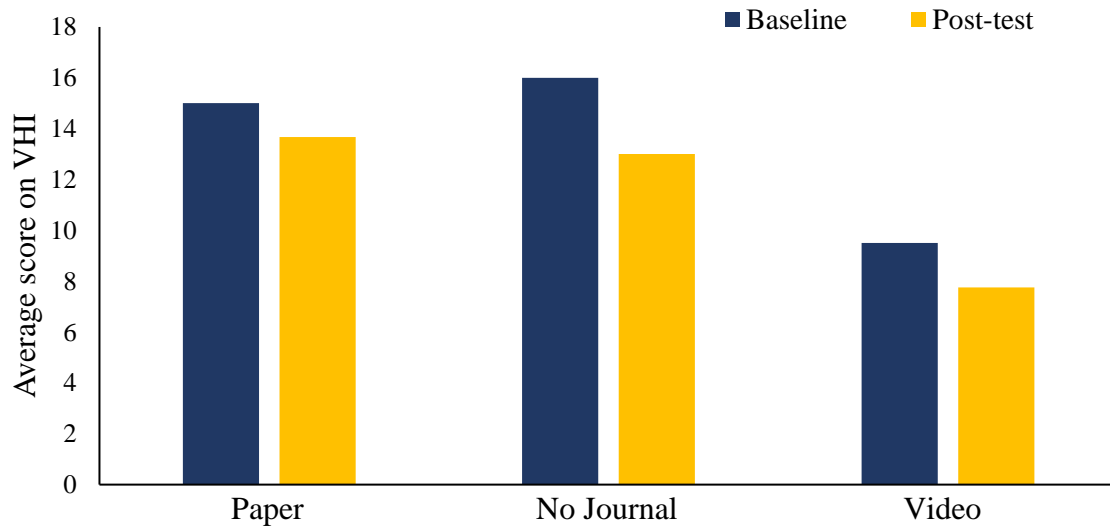


Table 3*Inter-Rater and Intra-Rater Reliability for Perceptual and Stroboscopic Analyses*

	Sustained Phonation	CAPE-V Sentences	Rainbow Passage	Monologue	Strobe
Inter-rater reliability (% agreement)	100%	100%	100%	97%	89%
Intra-rater reliability					
Judge 1 (AH)	86%	100%	100%	100%	100%
Judge 2 (KC)	86%	100%	100%	100%	100%

*Judged to be in agreement if within at least one point

Reliability

Table 3 shows percentages for both inter-rater and intra-rater reliability. The raters had complete agreement across most tasks, with the stroboscopic ratings showing the most differences. Within each judge, agreement was very high across tasks. Both inter- and intra-rater reliability were deemed acceptable.

Discussion**Do Participants Use Paper and Video Journals for Documenting Vocal Hygiene with Similar Compliance?**

Participants assigned to the video group had an 89.3% completion rate while participants in the paper group had 95.6% completion rate. Both groups had good compliance with journal completion, regardless of method of journaling. The video group completion rate was influenced by a single participant who missed six recordings (of a required 21). It is possible that this participant completed the activities and reflections, but the technology failed to record it. A second possibility is that she simply didn't have time to do all of the video journals. This participant did not provide an explanation at the final interview. Overall, participants in the video

group, other than this single participant, completed the journals with equal compliance to the paper journal group.

Participants reported that paper journals or the video journals were helpful for increasing compliance. In addition, the video journal group had the ability to set a reminder for whenever they desired to complete the journal. Some participants also entered a reminder in their personal planner, which may explain why those in the paper journal group had high levels of compliance. Participants who were in the no journal group did not use a personal planner (they were asked not to) and did not have scheduled time to reflect on their vocal hygiene. Not surprisingly, they shared in the follow-up that it was difficult to remember to practice because there was nothing to hold them accountable.

Does a Video Journal Help Participants Use Positive Vocal Hygiene Habits, as Compared to Paper or No Journal Use?

During the weekly meetings, participants reported estimated use of vocal hygiene habits over the previous week. No statistically significant differences between groups, on the basis of vocal hygiene behavior usage, were found. In other words, all groups were implementing vocal hygiene behaviors to some extent. The initial session with all participants was an educational session about vocal hygiene. In addition to learning about what vocal hygiene is and the three habits this study addressed; the participants also learned about what can happen when poor vocal hygiene is used. It is possible that this education primed them to begin using vocal hygiene habits more regularly, similar to the findings of Broaddus-Lawrence and colleagues (2000), who found their participants implemented their new knowledge about vocal hygiene.

The journals were an aid in holding participants adherent to changes in vocal hygiene behaviors, similar to Broaddus-Lawrence and colleagues (2000). At the final session, participants were asked about their thoughts about the assigned journal modality they had. Both the paper and video groups mentioned that having a physical journal had reminded them to complete their entries, while those in the no journal group reported some difficulty remembering to implement behaviors consistently. It was hypothesized that the video journals would see a higher rate of completion and better use of vocal hygiene habits due to videos having more immediacy and being reflective in nature, which could contribute to implementation of habits and overall better adherence (Aitken & Deaker, 2007). Within this study, paper journals and video journals seemed to both serve this purpose.

Participants' implementation of the vocal hygiene targets of reduced throat clearing and reduced loud talking were assessed on a daily basis within each individual throughout the duration of the study for those in groups with some sort of journal. The participants in the paper group implemented habits less frequently than those in the video group, although both groups did implement behaviors relatively consistently. Both groups used reminders, but those in the video group, had electronic reminders with an audio component, which may have served as a more alerting reminder to complete vocal hygiene tasks.

All video journal group participants received an iPod, on loan, to complete their recordings. Specific to the video journaling, it was hypothesized that participants would utilize the video method more eagerly. The participants in this study use technology on a daily basis, for personal and academic purposes. Participants reported that the video journal was easy to use and conformed to their lifestyle. Van Leer & Porcaro (2018), using a fake phone call protocol, illustrated that video/audio journaling or therapy practice could be effective, similar to the

themes found in our use of video journaling. The video group did see a lower completion rate than the paper. It is possible that the addition of a second device, the iPod, in addition to their own devices, created an extra layer of difficulty in remembering to access the device. Perhaps an application on their own devices would make this intervention more effective.

The participants in the video group provided more detailed responses in their daily reflections. This could be due to the ease of using video journals for recording one's thoughts. With video journals, participants were able to say exactly what they wanted without having to put in the effort of writing their thoughts. Paper group participants may have restricted themselves to writing brief thoughts, which could have affected thinking and implementing positive vocal hygiene behaviors.

Does a Video Journal Improve Voice Function, When Using Positive Vocal Hygiene Habits, as Compared to Paper or No Journal Use?

Participants all had an improvement in their voice. Specifically, perceptual measures increased across all groups. Acoustic measures had a slight improvement, and the stroboscopic results remained consistent from pre-test to post-test. The changes in all measures were very small in nature, which is consistent with day to day fluctuations in voice function. However, participants reported feeling their voice improved when they implemented vocal hygiene. Implementing healthy behaviors could lead to positive thoughts and feelings about their voice function, as demonstrated by Verdolini-Marston and colleagues (1994), who connected vocal hygiene to improved voice function. There could be a correlation between the improved voices and the initial education of what voice hygiene is and its benefits, although that was beyond the scope of this study. There is limited evidence to date about the impact of the reduction of throat clearing or the reduction in voice usage on voice quality.

Participants had some slight improvement (everyone was “normal”) in overall voice function. The monologue voice task showed most difference pre-to-post and across groups. The connected speech task, requiring greater cognitive load to create the message, may have led to less focus on clear voicing. In addition, the monologue provided more variety and usually a longer sample for scoring, which may also have affected listeners. Some variability could also be due to some participants having colds or allergies during one or both appointments, or in addition the variety of voice usage across participants due to sports.

Do Participants Rate their Voice Function Differently After Receiving Vocal Hygiene Education and Opportunities to Practice?

The Voice Handicap Index for each participant mildly improved from pre- to post- study. These results of improvement in quality of life measures, following implementation of vocal hygiene behaviors, are consistent with Behrman, Rutledge, Hembree & Sheridan (2008). Participants’ knowledge of vocal hygiene was gained after the initial session, which could have affected their thinking and ratings. Since participants did complete the VHI at their initial session and again approximately three weeks later, there could have been familiarity with the VHI. Familiarity could have led participants to rate questions differently from one time to the next, so test-retest reliability could be somewhat compromised, even though the VHI tends to be a robust, repeatable measure. Participants’ perception of their voice is important but was not measured directly in this study.

Limitations/Future Directions

One limitation of this study was the number and type of participants. The goal for this study was thirty participants; however, only eleven participants were recruited. In addition to a small sample size, all participants had normal voices, which does not reflect much opportunity

for change in the voice. While this was intentional for a pilot study, a future study may include more participants and those who are diagnosed with a voice disorder. This would allow an opportunity to observe greater change in the voice as a result of implementing vocal hygiene behaviors and tracking those using journals.

A second limitation was that the timeframe was short. Participants completed their pre- to post-study evaluation in approximately three-to-four weeks. In designing this intervention, the time frame was chosen to capture as many participants as possible during the regular academic term and be completed prior to final exams. Further, a longer time frame may have discouraged participation due to the length and expectations of the study. All participants were enrolled as college students who were recruited in April, which was close to the end of the academic year. Future studies may wish to choose a more individualized time frame for each participant to assess how vocal hygiene outcomes are impacted by time and various disorders.

Lastly, the measures of the effect of the vocal hygiene journaling could be improved. The questions included on the daily journal felt redundant and could be reworded to gather more and different information each day. Additionally, the acoustic measures used did not seem to be sensitive to small changes in participants' voices. Although most voice function measures were identified prior to the start of the study, a few additional measures were added during analysis. It is possible that some small changes were not measured with the tools chosen for this study. While adaptations to the journal questions could be made, there are not additional acoustic measures available to improve sensitivity at this time.

Conclusion

The purpose of this study was to examine different methods of tracking patient adherence to vocal hygiene habits to understand the impact on the overall functioning of the voice. The

secondary aim of the study was to evaluate the utility of a video journal as a method for monitoring home use of vocal hygiene behaviors versus using a paper journal or no journal. Journaling was effective, but the video journals didn't seem to be better than the paper journals. Vocal hygiene education seemed to be helpful for participants in order to understand the impacts of positive vocal hygiene habits. Finally, there was very limited change in participants' voice function while having a normal vocal mechanism because all participants had generally normal voice function to start.

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Appendix A

Daily journal questions

- | | | | |
|--|------|------|------|
| 1. Did you rest your voice today for at least 10 minutes? | Yes | No | |
| 2. How much throat clearing did you do today? | None | Some | Lots |
| 3. How much loud talking did you do today? | None | Some | Lots |
| 4. How do you feel your voice sounds today? | | | |
| 5. How do you think these habits are affecting you and your voice? | | | |

Appendix B

Demographic questionnaire

1. Gender: _____
 2. Age: _____
 3. Current voice complaints (if any): _____
 4. History of voice disorders (nodules, polyps, laryngitis, etc.): _____
 5. Describe your typical daily voice use (consider the following): _____
 - Singing (choir, solo)
 - Yelling
 - Work-related
 - Telephone/videochat usage (Snapchat included)
 - Public speaking
 - Athletics
-
- | | | | | | |
|----------------------------------|-----------|---|---|---|----------------|
| | No stress | | | | Extreme stress |
| 6. Rate your daily stress level: | 1 | 2 | 3 | 4 | 5 |
7. Current water intake (estimated ounces): _____
 8. Current caffeine intake (estimated ounces): _____

Appendix C

Weekly check-in questionnaire

Did you rest your voice this week for at least 10 minutes?	Yes	No	
How much throat clearing did you do this week?	None	Some	Lots
Did you feel more aware of your throat clearing?	Yes	No	
How much loud talking did you do this week?	None	Some	Lots
Did you feel more aware of your loud talking?	Yes	No	
How did your voice sound this week?			

How are these habits affecting you and your voice?

Appendix D

Acoustic data rating form

Participant number:

Overall Rating	0	1	2	3	4	5
	Normal					Abnormal/severe

Comments (any unusual findings or roughness/breathiness): _____

Appendix E

Strobe Rating Form

Participant ID: _____ Date: _____

Closure pattern: Typical Hourglass Anterior chink Posterior chink Spindle Other:

Vocal fold edge	0	1	2	3	4	5
	Smooth/straight					Rough/irregular

Supraglottic Involvement phonation	0	1	2	3	4	5
	None					False vocal fold

	Left	0	1	2	3	4	5
Amplitude movement	Normal		Slight Decrease	Moderate Decrease	Severe Decrease	Barely perceptible	No visible movement
	Right	0	1	2	3	4	5

	Left	0	1	2	3	4	5
Mucosal wave	Normal		Slight Decrease	Moderate Decrease	Severe Decrease	Barely perceptible	Absent
	Right	0	1	2	3	4	5