Voice Rest and Augmentative and Alternative Communication: A Feasibility Study

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Voice Rest and Augmentative and Alternative Communication: A Feasibility Study

Master's Thesis

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Background:

Voice disorders are problematic for patients on a number of levels. Not only do they cause physical discomfort and/or pain, but they also make day-to-day communication difficult and may have a negative impact on a patient's ability to perform his or her job. Those whose occupations require frequent, prolonged voice use on a regular basis, such as teachers, entertainers, clergy, and telephone marketers, report experiencing voice disorders at rates in excess of their representation in the general workforce (Titze, Lemke & Montequin, 1997).

Prevalence rates of voice disorders among teachers have been found to be particularly high: Roy, Merrill, Thibeault, Parsa, Gray, and Smith. (2004) found that 11% of teachers were currently experiencing voice disorders compared with 6.2% of non-teachers, and that 57.7% of teachers experienced a voice disorder throughout their lifetime, as opposed to 28.8% of non-teachers. Additional research shows that teachers experiencing voice disorders feel restricted in their ability to do their job and are more likely to miss work than those whose jobs require less dependence on their voice (Roy, Merrill, Thibeault, Gray, & Smith, 2004). It stands to reason that those in other vocally demanding occupations who have voice disorders may experience similar negative effects.

When individuals seek treatment for voice problems, otolaryngologists may instruct them to avoid using their voice for a specified period of time, a practice commonly referred to as voice rest. Voice rest is often prescribed to encourage healing following the removal of benign vocal

fold lesions (Behrman & Sulica, 2003), or to allow a problem of an alternative origin (e.g., acute laryngitis or vocal fold hemorrhage) to improve or resolve on its own (Rousseau et al., 2011). While voice rest is prescribed with some frequency, there is very little research exploring its effectiveness in promoting recovery from surgery or voice disorders. Koufman and Blalock (1989) suggest that this is at least partially due to a lack of patient compliance with voice rest, as well as variation in the duration and guidelines for voice rest between physicians.

Current research supports the notion that patient compliance with prescribed voice rest is low. In a study of 84 patients on voice rest, Rousseau, Cohen, Zeller, Scearce, Tritter, and Garrett (2011) found that only 34.5% were compliant with prescribed voice rest. While compliance was higher among post-operative patients than non-post-operative patients (42.4% versus 16%), it was still relatively low. There is little additional research on the degree of patient compliance with voice rest; however, research has been conducted on patient compliance with voice *therapy*, which may include “completion of daily voice exercises, acquisition and generalization of improved voice production technique, elimination of vocally damaging behaviors, and in some instances, reduction of overall voice use” (van Leer and Connor, 2010, p. 458). Hapner, Portone-Maira, and Johns, III, (2009) studied patient adherence to voice therapy and found that 65% of patients did not complete a full course of therapy. While voice rest and voice therapy differ in many ways, these data suggest that patients have a difficult time altering the ways and frequency with which they use their voice, even when advised to do so by a physician. The data on voice rest and voice therapy are not drastically different from those pertaining to certain other health-related behavioral changes: “dropout rates in weight loss, asthma care, addiction treatment, and psychotherapy are reported at 30-60%” (Hapner et al., 2009, p. 337). Van Leer and Connor (2010) studied patient perceptions of adhering to voice therapy and found that obstacles to adherence included the difficult nature of learning and practicing the vocal exercises, embarrassment associated with the exercises, the challenge of

self-monitoring/self-awareness required to maintain vocal changes, and a lack of time. Given the longer-term nature of voice therapy, as well as behavioral modifications associated with addiction treatment or psychotherapy, these obstacles are not surprising. Voice rest, on the other hand, is more acute in nature—it is relatively short in duration but requires the complete cessation of what is, for most individuals, the primary method of communication. While embarrassment and self-monitoring challenges may contribute to poor voice rest compliance, the inability to communicate using one's voice is likely the most significant obstacle to compliance.

There is limited scientific evidence on the efficacy of voice rest as both a treatment for voice problems and an agent for recovery from laryngosurgery, resulting in inconsistent and highly variable recommendations for duration of voice rest. Thus, the duration of voice rest prescribed is often based on physicians' experience and/or personal preference. As noted above, Rousseau et al. (2011) found that patient compliance with voice rest is relatively low, making it difficult to assess and measure the impact of voice rest on recovery from vocal illness, trauma, and/or vocal fold surgery. Further, patients may not derive the maximum benefit from voice rest when they fail to comply.

Rousseau et al. (2011) reported that patients on voice rest communicated through a variety of alternative means, with 92.7% of patients using writing, 84.3% using gesture, 79.5% using texting or email, 51.8% mouthing words, 20% whispering, 3.6% using sign language, 2.4% using a dry erase board, and 1.2% each using a cowbell, pre-recorded messages, a computerized speech program, or Microsoft PowerPoint. That the patients in this study came up with such a variety of alternatives to speaking highlights the need for individuals to find effective ways to communicate while on voice rest; however, in the same study, 65.5% of patients reported non-compliance with voice rest and "experienced social restrictions, had difficulty in communication, and were unable to work, leading to feelings of frustration and being

handicapped while on voice rest." These findings indicate that their alternative communication strategies were not comprehensive, nimble, practical, or otherwise useful enough to be completely effective.

Thus, the present study was intended to determine whether access to a user-friendly and efficient text-to-speech (TTS) augmentative and alternative communication (AAC) device influences patient compliance with voice rest. Binger and Kent-Walsh (2010) define AAC as "some form of communication that is designed to either supplement or replace more typical means of communication. Frequently, this means using something other than speech to communicate" (p. 3) Historically, AAC has been applied to populations that are temporarily or permanently unable to speak (Fried-Oken, Howard, & Roach Stewart, 1991). In the literature, a variety of low-technology (e.g., dry-erase boards) and high-technology (e.g., speech generating devices, SGDs) AAC options have been implemented as dictated by patient need and system availability. While low-tech options like alphabet boards or dry-erase boards tend to be less expensive, high-tech options may be faster and more dynamic, and, therefore, better received by one's communicative partners. Indeed, in a study of individuals' perceptions of an AAC-user, Gorenflo and Gorenflo (1991) found that people's attitudes were more favorable, both in general and in terms of their tendency to interact with the AAC-user, when a device with simulated voice output (voice output communication aid, VOCA) was utilized. It must be noted that the voice output device was compared to a standard alphabet board that the user manipulated by pointing to the individual letters in the words he wished to express, a process that would certainly be slower and less efficient than typing a message. With this point in mind, Raney and Silverman (1992) conducted a follow-up study comparing individuals' perceptions of an AAC-user communicating via an alphabet board with only letters to one that included both letters and common words and phrases. They found that attitudes toward the AAC-user were more favorable when he used the latter board, a finding "consistent with Gorenflo & Gorenflo's

hypothesis that attitude favorability increases '… with the sophistication of the augmentative communication technique'" (p. 1270). A direct comparison of attitudes toward use of the more sophisticated alphabet board and a TTS device was not part of the study, but Raney and Silverman conceded that "favorability ratings for the VOCA probably would still be higher" (p. 1270). Additionally, Fried-Oken (2001) observed that when a patient in the intensive care unit used a Lightwriter® TTS SGD, medical personnel "took the time to listen and did not ask only yes/no questions" (p. 140), requested more information from him than when he used a wipe-off board, and "considered [him] more cognitively and linguistically competent" (p. 140) than when he used other non-speech communication techniques.

The research described above guided the rationale for the selection of the Lightwriter as the TTS device used in this study. The Lightwriter is a portable, dedicated SGD with a two-sided display, interchangeable keyboard (QWERTY or ABCD layout), and rate enhancement features, making it applicable to users who are literate (but not necessarily computer literate) and temporarily unable to speak. In addition, it offers a number of advantages over low-tech AAC options, including typically greater speed and efficiency of use and a lack of required visual contact between the user and his/her communicative partner that allows it to be used in a wider range of contexts, including over the phone. The sophisticated nature of the Lightwriter and the features it includes suggested that it would be better received by our participants' communicative partners than other communication options, thereby encouraging greater utilization and, potentially, less voice use.

If the Lightwriter did indeed encourage or increase patient compliance with voice rest as hypothesized, the results of this study would substantiate further investigation into the practicality and benefit of providing patients with a high-tech AAC device for the duration of voice rest. Additionally, a proven method of increasing compliance would allow for future research into the healing and voice outcome benefits of voice rest.

Methods:

Participants

Participants were seven patients from the Vanderbilt Voice Center who underwent vocal fold surgery. Patients were prescribed up to seven days of post-surgical voice rest and were randomized to one of two groups: the experimental group (TTS) (n=4), members of which received a TTS device to use while on voice rest, and the control group (CON) (n=3), the members of which received the standard of care treatment. All participants completed daily voice use surveys during the week before surgery and during the prescribed voice rest period following surgery (data collection instruments are described below). All participants met the following criteria for inclusion in the study:

- Males and females
- 18 years and older
- Post-surgical patients
- Physician order of voice rest
- Informed consent from participant

Exclusion criteria for this study included the following:

- Individuals under 18 years of age
- Individuals not willing to participate

Procedures and Description of Self-Report Instruments

Before beginning the study, all participants signed a document of informed consent. After consenting to participate in the study, participants were randomly assigned to the control or TTS group. Regardless of group assignment, all participants received a pre-surgical voice use questionnaire packet (Appendix A), a post-surgical voice use questionnaire packet

(Appendices B and C), and an expanded survey (Appendices D and E) intended to help summarize participants' experience with voice rest. The post-surgical questionnaires differed depending on group assignment: post-surgical questionnaires for the TTS group (Appendix C) included specific questions about participants' experiences with the TTS device that were not included in the post-surgical questionnaires for the control group (Appendix B). Additionally, participants in the TTS group were provided with a TTS device and a 20-30 minute training session in its use. Training was provided by a member of the research team and included an explanation of the device's functionality, battery charging guidelines, and basic operational features. Participants were also provided with a set of printed instructions regarding the TTS device (Appendix F) to use as a reference during the voice rest period.

Pre-Surgical Questionnaire

Once a day for up to seven days prior to surgery, participants completed a daily questionnaire (included in the pre-surgical questionnaire packet) to gauge their voice use over the preceding 24 hours. Amount of voice use was measured in response to the question, "How much did you use your voice today (including whispering)?" using a 100-mm visual analog scale (VAS) with anchors of "not at all" and "every time I wanted to communicate" at 0 mm and 100 mm, respectively. Additional data was collected regarding participants' estimation of their maximum loudness, other modes of communication utilized, and other variables thought to play a role in voice use, such as whether or not participants worked or went to school each day and the number of other adults and children in the household.

Post-Surgical Questionnaire

Once a day for up to seven days following surgery (i.e., during the prescribed voice rest period), participants completed a daily questionnaire to gauge their voice use over the preceding 24 hours. As with the pre-surgical questionnaires, participants reported amount of

voice use, maximum loudness of voice use, other methods of communication utilized, work/school status, and number of adults and children in the household. Patients in the TTS group were also asked to report on amount of TTS device use in response to the question, "How much did you use the Lightwriter SL-40 device today instead of using your voice or whispering?" using a 100-mm VAS with anchors of "not at all" and "every time I wanted to communicate" at 0 mm and 100 mm, respectively.

Expanded Survey

All participants received an expanded survey, included at the end of the post-surgical questionnaire packet, designed to collect qualitative information regarding patients' behavioral and emotional experiences with voice rest. For example, the expanded survey for the control group (Appendix D) asked participants to indicate how challenging voice rest was for them and whether or not it impacted their personal/social lives. The expanded survey for the TTS group (Appendix E) included the same set of questions, as well as a series of items about their use of the TTS device in various settings (e.g., at home, at work, and in public) and their level of comfort with using the device in these settings.

Pre- and post-surgical data were collected via hard-copy questionnaires and transferred by the research team to the Research Electronic Data Capture (REDCap) tools hosted at Vanderbilt University (Harris, 2009). REDcap is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

Primary and Secondary Research Questions

Primary Research Question: Is there a difference in post-operative voice use between the control and TTS groups, as measured on a 100 mm VAS?

The goal of the full-scale VoRAAC study is to determine whether access to TTS has an effect on patient compliance with voice rest, as indicated by comparing group trends in post-surgical voice use. However, given the small number of participants who have completed the study at present, group analyses are premature; rather, in this preliminary report, two aspects of participant performance will be assessed: 1) whether individual participants who have completed the study were compliant with voice rest following surgery, based on amount of reported post-surgical voice use; and 2) whether there were any observable trends or differences among the participants.

From a medical perspective, compliance with prescribed voice rest is a binary concept: either a patient uses his/her voice during the voice rest period (non-compliance) or he does not (compliance). However, absolute cessation of voice use for an extended period of time may be unrealistic given individuals' personal needs or circumstances (e.g. family or occupational obligations, or safety issues). Therefore, for the purposes of this study, compliance was conceptualized as a spectrum, with mean post-surgical VAS scores (also referred to as *compliance scores*) closer to 0 mm indicating greater compliance and mean scores closer to 100 mm indicating less compliance. Because there is presently a lack of evidence on the impact of varying amounts and intensities of voice use on tissue recovery and voice outcomes following surgery, an arbitrary cutoff of 25 mm or less was used to indicate compliance with voice rest. Mean scores above 25 mm were indicative of non-compliance. Given the question used to measure voice use (see the description of the questionnaires above), a mean score of 25 mm or less indicates that the patient refrained from voice use at least 75 percent of the time that he or

she wanted to communicate, a percentage deemed acceptable in the absence of concrete evidence to the contrary.

Secondary Research Question: On a subject-by-subject basis, is there an observable relationship between the amount of voice use and the amount of TTS use reported by participants in the TTS group during the post-surgical voice rest period?

To examine the influence of TTS device access on compliance with voice rest, the amount of post-surgical voice use reported by each TTS participant was compared to his or her reported amount of TTS use. An inverse relationship between the two (high TTS use and low voice use) is hypothesized to indicate that TTS use offset—or replaced—voice use.

Results[1]:

Primary Research Question: Patient Compliance

Descriptive profiles of each participant are presented below, along with individual pre- and post-surgical voice and TTS use data.

Control Group Participant 1 (C1)

(C1) was a 43-year-old male treated for a vocal fold polyp. He had a high school education and worked as a builder, there were no other people in his household, and he did not describe himself as a singer. He worked on each of the seven days prior to his surgery and his estimated average maximum loudness for the seven-day pre-surgical period was "conversational level."

As shown in Table 1, C1's mean amount of pre-surgical voice use was 63. Recalling that the VAS scale's maximum value was anchored with "every time I wanted to communicate," this

[1] This is a feasibility report on a randomized controlled study. The present data represent preliminary findings in an ongoing Voice Rest/Augmentative and Alternative Communication (VoRAAC) investigation.

suggests that pre-surgically, he communicated with his voice just over 60% of the time, and either relied on other forms of communication or opted not to communicate roughly 40% of the time.

During the post-surgical period, C1 did not attend work and, in terms of maximum loudness for the voice rest period, indicated that he did not use his voice. C1's post-surgical voice-rest period lasted six days. His mean post-surgical VAS score for voice use (i.e., his compliance score) was .83, indicating that he almost never used his voice to communicate. Based on additional data provided by C1, he relied on such alternative modes of communication as gestures, writing, and text messaging or emailing during the post-surgical period.

Time Period and Modality	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean	Compliance Score
Pre-surgical Voice Use (VAS Score in mm)	76	60	63	56	58	69	61	63	
Post-surgical Voice Use (VAS Score in mm)	1	1	0	1	0	2	N/A	.83	.83

Table 1. C1's daily and mean pre- and post-surgical amount of voice use and compliance score.

C1 also exhibited a substantial decrease in day-to-day voice use during the voice rest period, with a mean decrease in voice use from pre-surgery to post-surgery of 62.17 mm. This drastic decrease is visible in Figure 1, which depicts C1's pre- and post-surgical VAS scores for voice use.

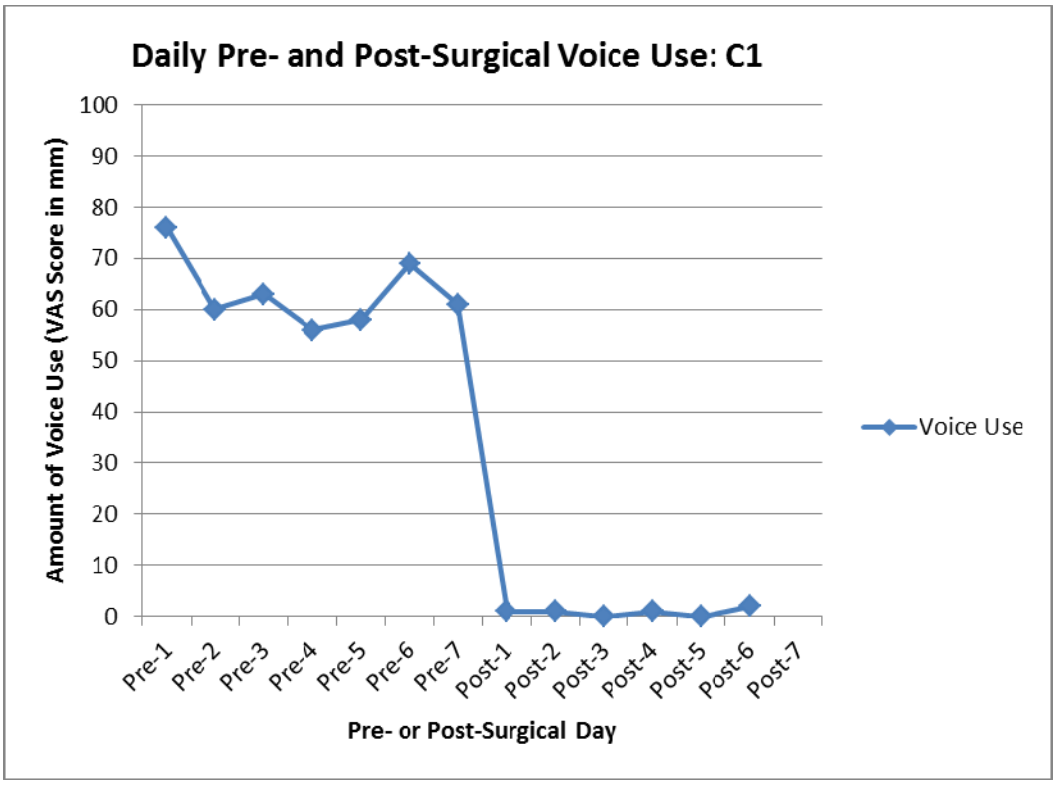


Figure 1. C1's pre- and post-surgical amount of voice use as measured by self-reported VAS scores.

Control Participant 2 (C2)

Participant C2 was a 43-year-old male treated for a vocal fold cyst/pseudo-cyst. He had an 11th grade education and worked as a coal miner. He lived with one adult and two children and did not describe himself as a singer. C2 worked on six of the seven days prior to surgery. During this time, his estimated average maximum loudness was "talking loudly" and, as shown in Table 2, his mean VAS score for voice use was 100 mm, indicating that he used his voice every time he wanted to communicate.

Six days of post-surgical voice use data were collected for C2. During this period, C2 did not attend work and his average maximum loudness was a whisper. C2's mean post-surgical voice use score (compliance score) was 52.4 mm.

Time Period and Modality	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean	Compliance Score
Pre-surgical Voice Use (VAS Score in mm)	100	100	100	100	100	100	100	100	
Post-surgical Voice Use (VAS Score in mm)	14	27	44	62	81	86.5	N/A	52.4	52.4

Table 2. C2's daily and mean pre- and post-surgical amount of voice use and compliance score.

C2's compliance score indicates that he used his voice about half of the time he wanted to communicate during the voice rest period. This number suggests low compliance with voice rest, though it may be worth noting that C2 reduced his mean voice use by 47.6 mm following surgery. As indicated in Figure 2, C2 used his voice more post-surgically each day than he did on the preceding day. Additionally, he communicated by gesturing, mouthing words, writing, and text messaging/emailing.

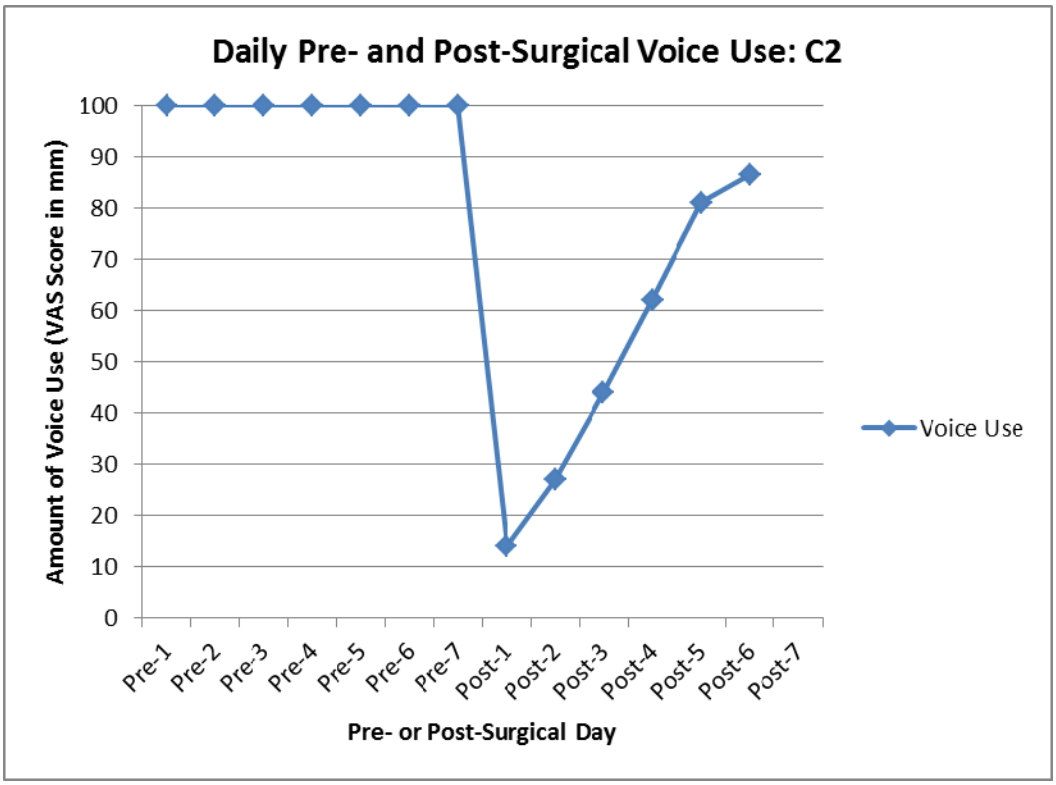


Figure 2. C2's pre- and post-surgical amount of voice use as measured by self-reported VAS scores.

Control Participant 3 (C3)

C3 was a 36-year-old male treated for a vocal fold polyp/cyst. He completed his bachelor's degree and worked as a teacher and basketball coach. His household includes one other adult and five children, and he is not a singer. He worked on five of the seven days prior to his surgery and his estimated maximum average loudness that week was "talking loudly." His mean amount of pre-surgical voice use was 91.3 mm (see Table 3), suggesting that he almost always relied on his voice when he wanted to communicate, though he also used gestures, writing, texting/emailing, and mouthing words.

C3 worked on one of seven days for which he provided post-surgical data. During this period of voice rest, his mean amount of voice use (compliance score) was 2.3 mm, which indicates that he almost never used his voice to communicate. This is reflected in his responses for estimated maximum loudness, for which he selected "I did not use my voice" on all seven post-surgical days. While on voice rest, he communicated by gesturing, mouthing words, writing, and texting/emailing. C3's mean VAS score for voice use decreased by 89 from pre- to post-surgery, as is visible in Figure 3.

Time Period and Modality	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean	Compliance Score
Pre-surgical Voice Use (VAS Score in mm)	99	97	99	99	100	75	70	91.3	
Post-surgical Voice Use (VAS Score in mm)	1	3	2	2	1	1	6	2.3	2.3

Table 3. C3's daily and mean pre- and post-surgical amount of voice use and compliance score.

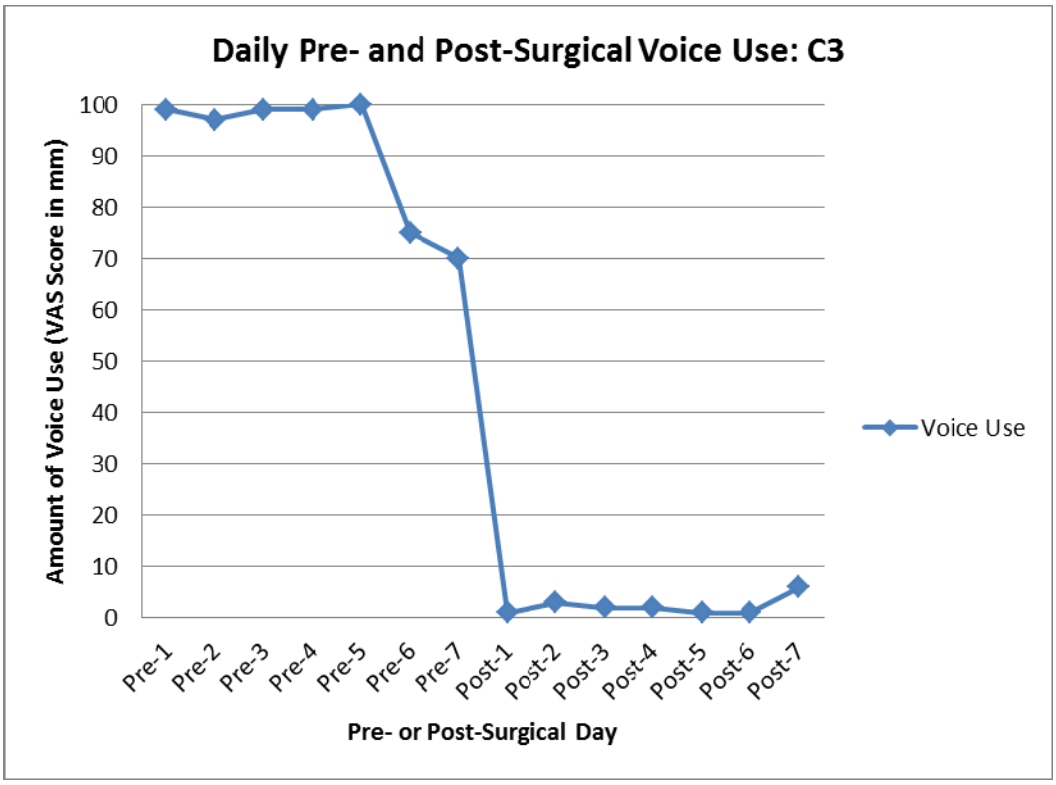


Figure 3. C3's pre- and post-surgical amount of voice use as measured by self-reported VAS scores.

TTS Participant 1 (T1)

T1 was a 25-year-old female treated for a vocal fold polyp. She completed her GED, worked in the food service industry, lived with one other adult, and described herself as a singer. She worked on each of the seven days prior to surgery and her estimated average maximum loudness for the seven-day pre-surgical period was "talking loudly." As shown in Table 4, T1's mean amount of pre-surgical voice use was 61.9 mm, indicating that pre-surgically she used her voice about 60% of the time she wished to communicate. Other modes of communication T1 utilized during this period included gestures, mouthing words, and text messaging/emailing.

T1 provided data for five post-surgical days. She did not work during those five days, and her average maximum loudness during that period was a whisper. Post-surgically, T1's

mean amount of voice use (compliance score) was 8 mm, suggesting that during her five days of voice rest she rarely used her voice to communicate. While on voice rest, she also communicated via writing, text messaging/emailing, and the TTS device. T1's mean VAS score for voice use decreased by 53.9 mm from pre-surgery to post-surgery; this decrease is shown in Figure 4. Her VAS scores for daily TTS use in the post-surgical period are also shown in Figure 4. Results regarding the relationship between post-surgical voice use and TTS use are provided later in this report.

Time Period and Modality	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean	Compliance Score
Pre-surgical Voice Use (VAS Score in mm)	76	56	60	48	65	67	61	61.9	
Post-surgical Voice Use (VAS Score in mm)	5	8	12	11	4	N/A	N/A	8	8
Post-surgical TTS Use (VAS Score in mm)	4	7	4	3	4	N/A	N/A	4.4	

Table 4. T1's daily and mean pre- and post-surgical amount of voice use, compliance score, and post-surgical TTS use.

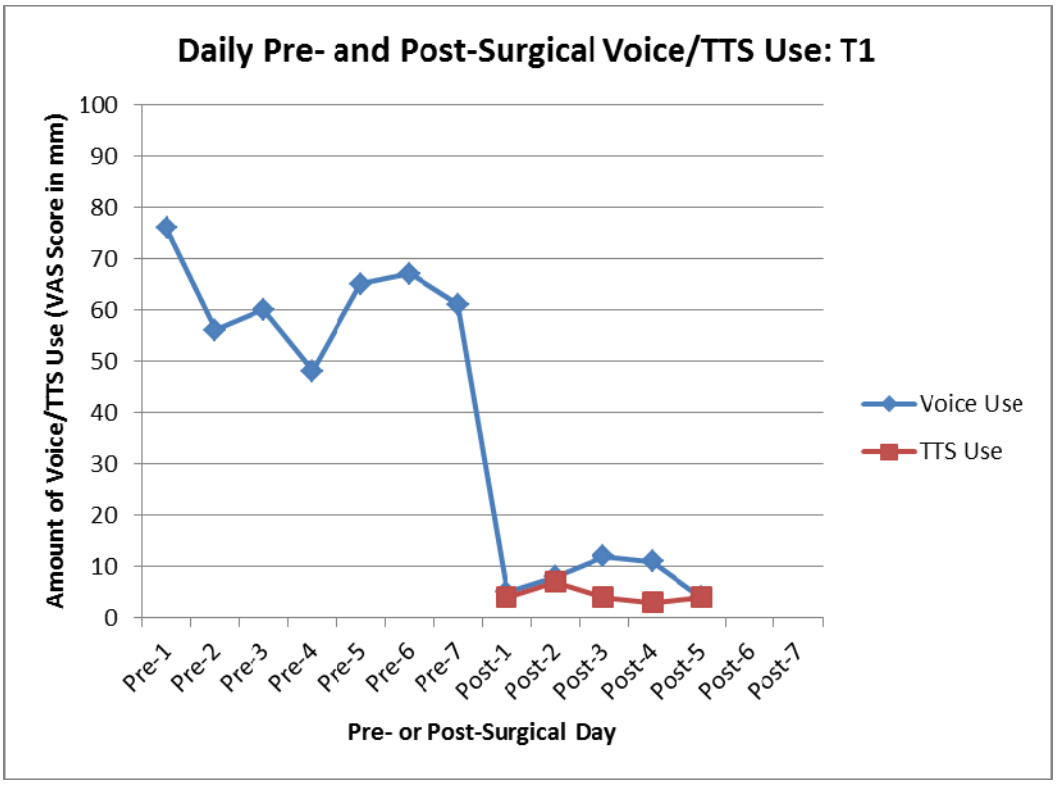


Figure 4. T1's pre- and post-surgical amount of voice use and post-surgical TTS use as measured by self-reported VAS scores.

TTS Participant 2 (T2)

T2 was a 40-year-old male treated for a cyst/pseudo-cyst. He had a master's degree and worked as a financial planner, and he lived with one child. He did not describe himself as a singer. He worked on each of the seven days leading up to his surgery, and his estimated average maximum loudness during that period was a "conversational level." T2's mean amount of pre-surgical voice use was 100 mm, indicating that he used his voice to communicate whenever he wanted to during this period, though he also reported using writing and text messaging/emailing.

T2 provided seven days of post-surgical data and worked on four of those days. His mean post-surgical voice use (compliance score) was 6.9 mm, which indicates that he used his voice rarely while on voice rest. For maximum loudness during voice rest, T2 indicated that he

did not use his voice except on days 5 and 6, for which he indicated that he whispered. During the post-surgical period, T2 also communicated via gesture, mouthing words, writing, text messaging/emailing, and TTS. His pre-and post-surgical voice use and TTS use are provided in Table 5. T2's mean VAS score for voice use decreased by 93.1 mm; his daily voice use before and after surgery is illustrated in Figure 5.

Time Period and Modality	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean	Compliance Score
Pre-surgical Voice Use (VAS Score in mm)	100	100	100	100	100	100	100	100	
Post-surgical Voice Use (VAS Score in mm)	1	1	2	2	12	29	1	6.9	6.9
Post-surgical TTS Use (VAS Score in mm)	54	2	1	33	5	1	4	14.3	

Table 5. T2's pre- and post-surgical amount of voice use and post-surgical TTS use as measured by self-reported VAS scores.

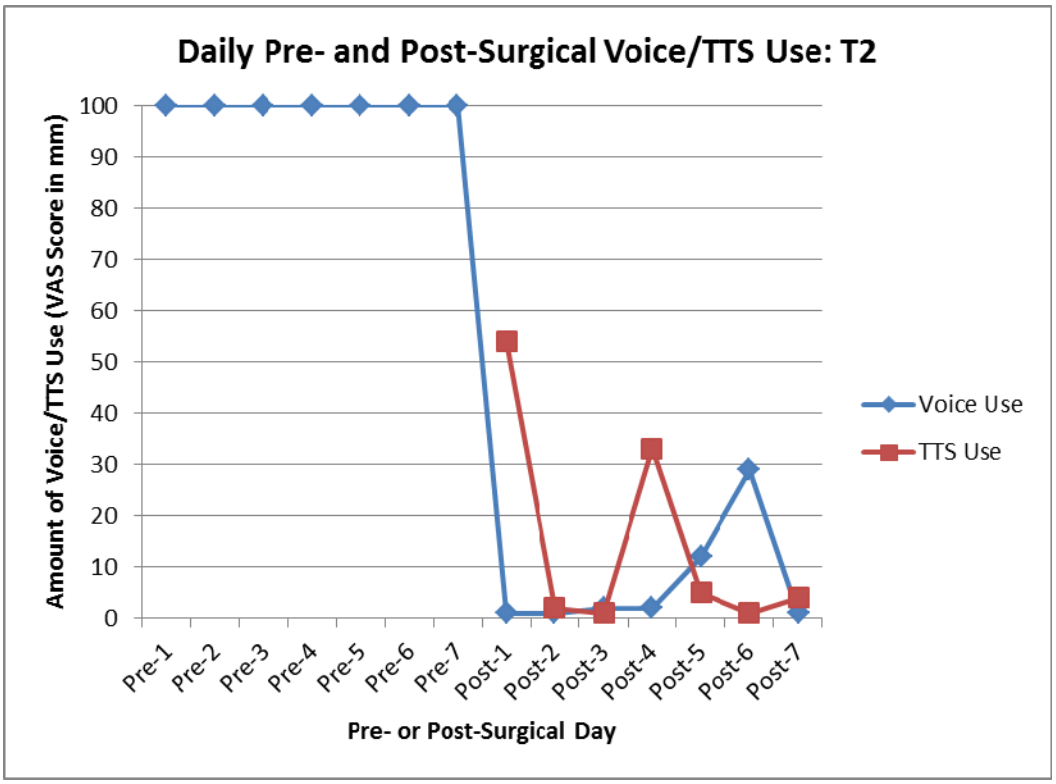


Figure 5. T2's pre- and post-surgical amount of voice use and post-surgical TTS use as measured by self-reported VAS scores.

TTS Participant 3 (T3)

T3 was a 48-year-old female who underwent laryngosurgery to treat a polyp/vascular polyp. She had a high school education and worked as an assistant automotive service manager, and there was one other adult in her household. She did not describe herself as a singer. She did not go to work during the seven days prior to surgery and her estimated average maximum loudness during this period was a "conversational level." T3's mean amount of pre-surgical voice use was 59 mm, indicating that she used her voice to communicate nearly 60% of the time. The only other mode of communication she reported using pre-surgically was text messaging/emailing.

Post-surgically, T3 provided four days of data. She did not work during that four-day period. Her mean post-surgical VAS score for voice use (compliance score) was .5 mm, representing a decrease of 58.5 mm for mean voice use from pre- to post-surgery and suggesting that she virtually never used her voice during four days of voice rest. This is supported by the fact that for maximum loudness, she selected "I did not use my voice" for all four days. During this period, T3 communicated by gesturing, writing, text messaging/emailing, and using the TTS device. T3's pre- and post-surgical voice use and TTS use data are provided in Table 6 and charted in Figure 6.

Time Period and Modality	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean	Compliance Score
Pre-surgical Voice Use (VAS Score in mm)	86	59	51.5	58.5	56	50	52	59	
Post-surgical Voice Use (VAS Score in mm)	0	1	.5	.5	N/A	N/A	N/A	.5	.5
Post-surgical TTS Use (VAS Score in mm)	75.5	78.5	58	61	N/A	N/A	N/A	68.25	

Table 6. T3's pre- and post-surgical amount of voice use and post-surgical TTS use as measured by self-reported VAS scores.

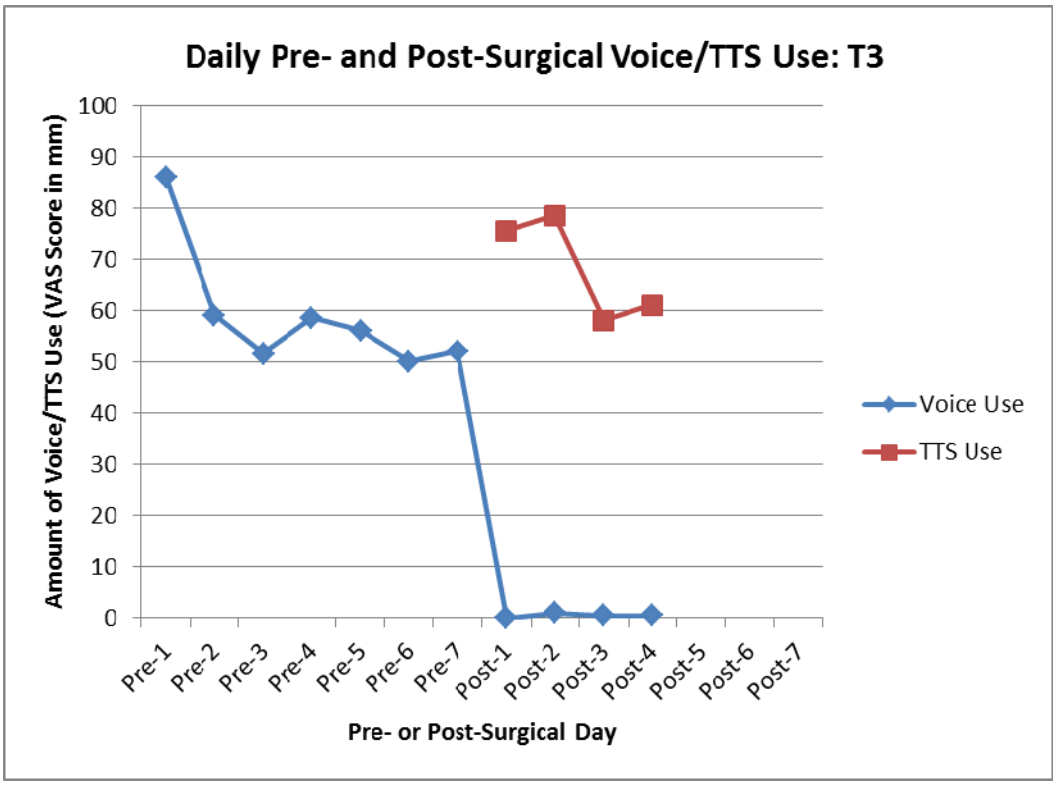


Figure 6. T3's pre- and post-surgical amount of voice use and post-surgical TTS use as measured by self-reported VAS scores.

TTS Participant 4 (T4)

T4 was a 59-year-old male treated for a polyp/vascular polyp. He had completed post-graduate work, and his occupation was vice president of finance for a university. There was one other adult in his household, and he did not describe himself as a singer. He worked on five of the seven days prior to his surgery and his average estimated maximum loudness during this period was a "talking loudly." T4's mean amount of pre-surgical voice use was 95.7 mm, indicating that he primarily used his voice to communicate prior to surgery. He also communicated via text message/email prior to surgery.

T4 provided seven days of post-surgical data, which is reported in Table 7. He did not work on any of the seven days following his surgery and for maximum loudness, he indicated

that he did not use his voice on any of these days. T4's mean amount of post-surgical voice use (compliance score) was 1.9 mm, suggesting that almost never used his voice to communicate. While on voice rest, he communicated by gesturing, mouthing words, writing, text messaging/emailing, and using the TTS device. As depicted in Figure 7, T4's mean VAS score for voice use decreased by 93.8 mm from pre-surgery to post-surgery.

Time Period and Modality	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Mean	Compliance Score
Pre-surgical Voice Use (VAS Score in mm)	99	98	98	98	90	88	99	95.7	
Post-surgical Voice Use (VAS Score in mm)	2	2	1	3	2	1	2	1.9	1.9
Post-surgical TTS Use (VAS Score in mm)	97	98	98	98	98	97	98	97.7	

Table 7. T4's daily and mean pre- and post-surgical amount of voice use, compliance score, and post-surgical TTS use.

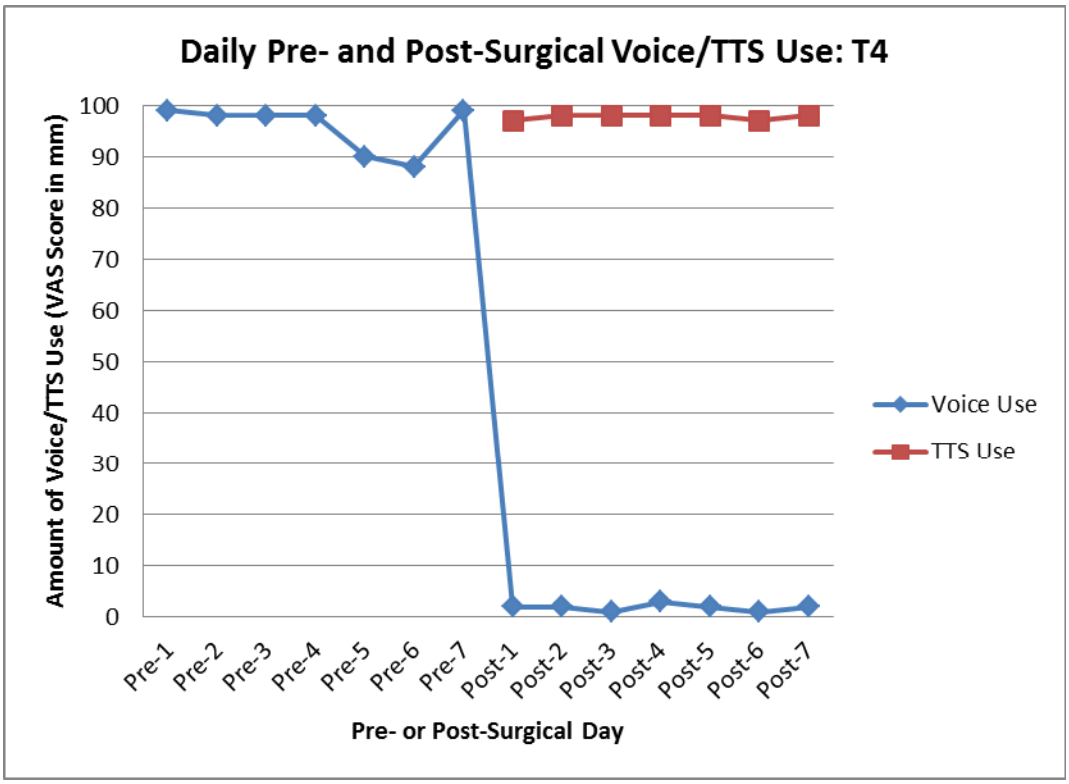


Figure 7. T4's pre- and post-surgical amount of voice use and post-surgical TTS use as measured by self-reported VAS scores.

Secondary Research Question: Voice Use vs. TTS Use

With four participants in the TTS group and seven or fewer days of data for each participant, there is too little data to calculate inferential statistics. However, the TTS participants' VAS scores for post-surgical voice and TTS use (presented previously in Tables 4 – 7) are plotted in Figures 8 – 11 to allow for a visual comparison of day-to-day communication behavior.

Figure 8.

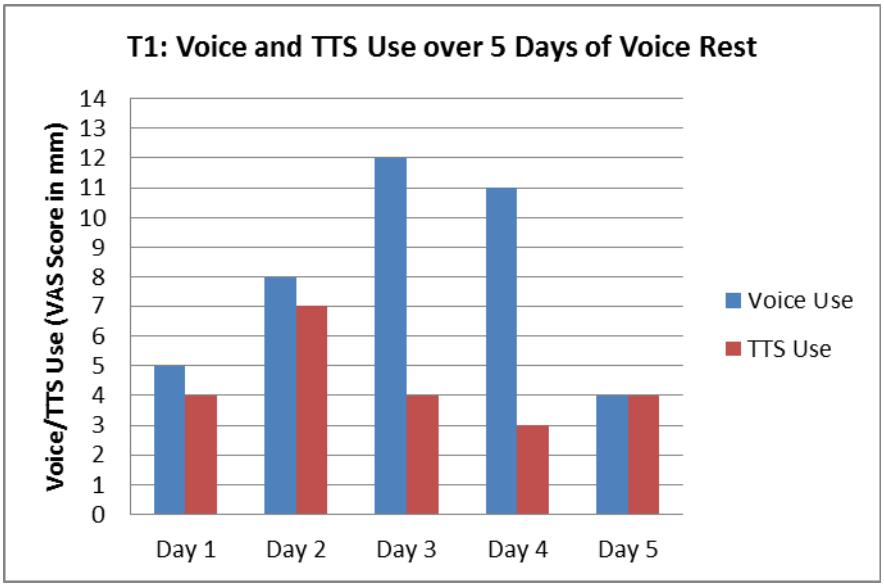


Figure 9.

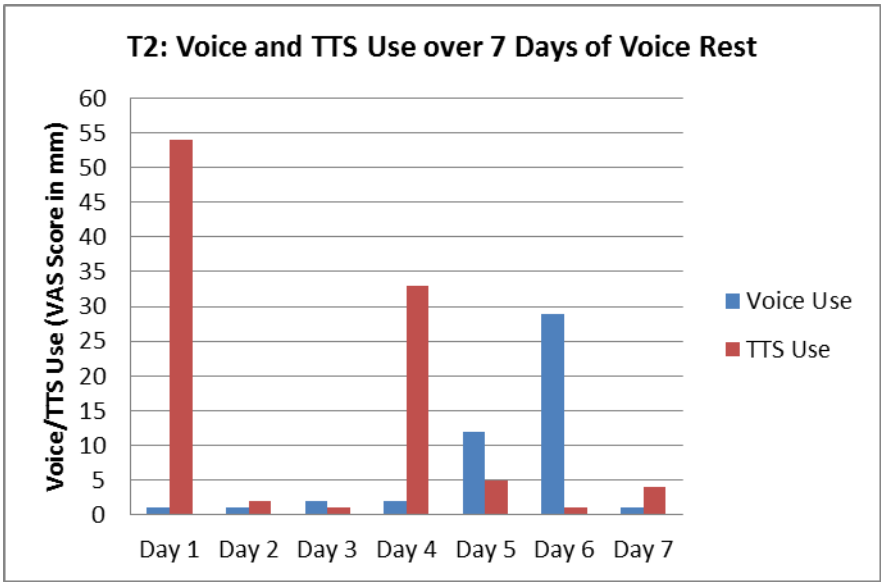


Figure 10.

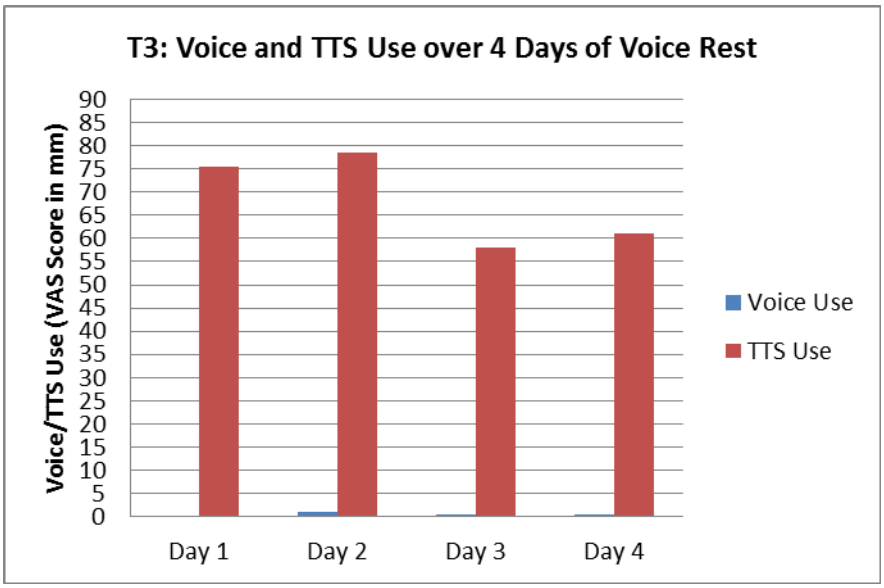
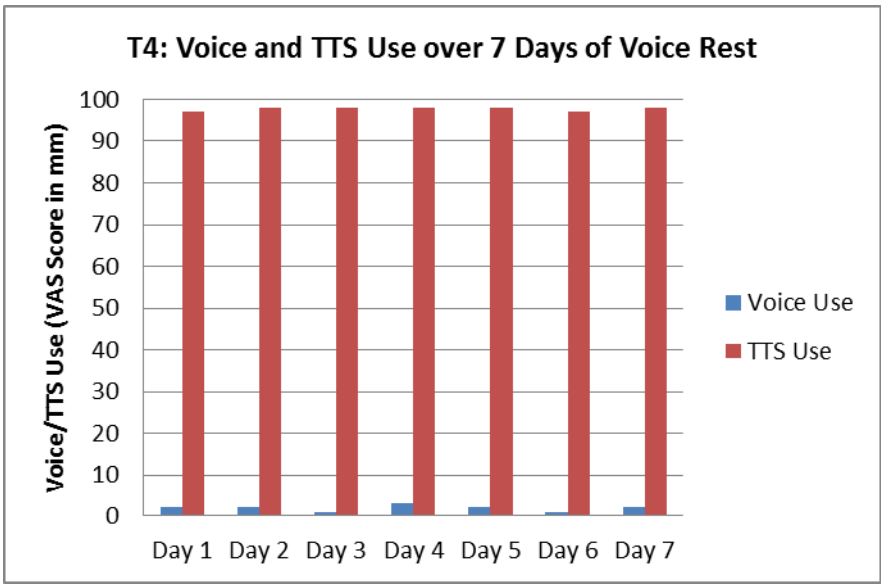


Figure 11.



As illustrated in Figures 8 and 9, post-surgical voice use and TTS use do not appear to be related for participants T1 and T2; rather, voice and TTS behaviors appear to be somewhat random. In contrast, Figures 10 and 11 depict very low levels of voice use in the presence of much higher levels of TTS use, which may suggest that for T3 and T4, use of the TTS device offset voice use and supported compliance. This observation is supported by the participants'

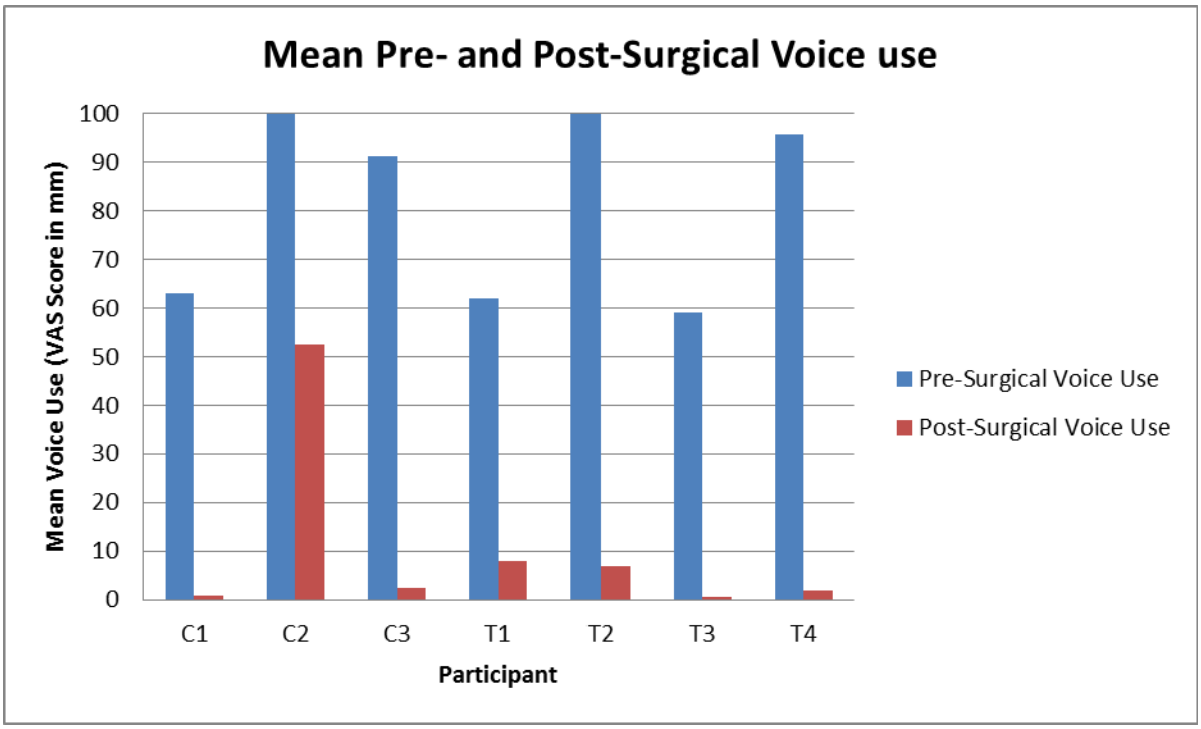
responses to the following expanded survey item: “Using the Lightwriter helped me avoid using my voice;” T1 and T2 selected “Agree,” while T3 and T4 selected “Strongly Agree.”

Discussion

Compliance with Voice Rest

The preliminary data collected thus far demonstrate varying levels of compliance with voice rest. A comparison of group means for amount of post-surgical voice use (CON: 18.5 mm vs. TTS: 4.3 mm) appears to suggest that the TTS participants used their voices far less than the CON participants; however, this is entirely due to a single participant (C2) whose mean post-surgical voice use score was 52.4 mm. Without C2, the CON and TTS groups all had mean post-surgical VAS scores of 8 mm or below. Further, C1 and C3’s mean scores (.83 mm and 2.3 mm, respectively) were lower than those of two members of the TTS group—T1 and T2—and were highly comparable to those of T3 and T4 (.5 mm and 1.9 mm, respectively). In fact, across both groups, only C2 was substantially non-compliant with voice rest (as illustrated in Figure 12); his mean voice use score was 44.4 mm higher than the next highest score, (8 mm, as reported by T1). By comparison, when compliance is conceptualized as a spectrum ranging from 0 mm (completely compliant) to 100 mm (completely non-compliant) the other six participants were quite compliant, with mean voice use scores ranging from .5 – 8 mm. In other words, six out of seven participants were highly compliant with voice rest, regardless of group assignment, suggesting that TTS access was *not* a factor in participant compliance with voice rest.

Figure 12. Participants' mean pre- and post-surgical VAS scores for voice use.



The concept of compliance at this stage is complicated by the fact that it may actually have more to do with other variables than TTS access. For example, the presence of other family members in the home could make compliance more difficult, especially if one has young children. C2 lives with one adult and two children; perhaps there were particular circumstances involving his family that caused him to use his voice more than other participants. Then again, C3 lives with one adult and five children and was still highly compliant with voice rest.

Another potential variable that may affect compliance is personality. In a study of the personality traits of individuals with voice disorders, Roy, Bless, and Heisey (2000) found that subjects with vocal nodules demonstrated "a predilection for socializing, but perhaps more noteworthy, they tend to take charge and like to be noticed in social situations." Whether or not such personality characteristics contribute to the development of vocal pathologies, it is logical that they may play a role in patient compliance with voice rest; in other words, it may be more

difficult for a highly social, extraverted individual who likes to stand out in social situations to restrict his/her voice use.

One would expect variables such as personality and household size to equalize between the two groups as more participants complete the study; at present, however, there is too little data to assume that they had no impact or the same level of impact on each group.

Relationships Between Voice Use vs. TTS Use

As is the case with the question of compliance, there are too few data at this point to determine whether TTS use consistently offset voice use following surgery; however, of the four TTS participants, T3 and T4 reported the lowest mean voice use and used TTS at substantially higher levels than T1 and T2, who had higher mean voice use scores and were therefore less compliant with voice rest. This would suggest that for some patients on voice rest, access to a TTS device *may* improve or support compliance by decreasing voice use. This is reinforced by the fact that the most compliant TTS participants strongly agreed with the statement that using the Lightwriter helped them avoid using their voices. Thus, the preliminary findings of this study suggest that further research is warranted. A larger participant population will allow for group analyses to determine if there is, in fact, a treatment effect associated with access to a TTS device.

It is possible that external variables influenced participants' use of the TTS device, and therefore the extent to which it contributed to their compliance. An individual's level of comfort with the device—both in terms of his/her ability to use it and his/her perception of any social stigma associated with it—is likely to affect the frequency with which he/she uses it. Indeed, this appears to have been a factor in determining how much the TTS participants used the device: in their expanded survey responses, the participants who used the device the least, T1 and T2, indicated that they were not comfortable using it in public or over the phone, whereas T3 had no

opinion about using the device in these contexts and T4 felt comfortable doing so. As more participants complete the study and additional data is collected, trends in level of comfort with the device and amount of device use will likely become more apparent.

Limitations of the Present Study

In analyzing these preliminary results, there are certain limitations that cannot be overlooked, especially as the present outcomes will help to shape the larger VoRAAC study.

One of the most significant limitations of this study was the use of self-report to gather all data. The subjective nature of self-report means that we are, in fact, analyzing patient's perceptions/interpretations of how much they use their voice or TTS device, rather than using an objective, quantifiable measure, such as time spent speaking or time spent using the device. One possible alternative to self-report would be to outfit participants with an Ambulatory Phonation Monitor (APM). Worn around the neck, an APM uses a small contact microphone to record laryngeal vibrations associated with phonation. The collected data can be uploaded to a computer and, using associated software, translated to provide the individual's total phonation time, as well as average fundamental frequency and amplitude. Similarly, there may be a way to adapt the Lightwriter or another TTS device to record the amount it is used over a given period. In other words, perhaps it could be outfitted to track either the total time it is used (i.e., the amount of time the participant spends typing on it) or the number of messages typed into it during the voice rest period.

Another advantage of using an APM to track patient compliance is that it provides information on amplitude of speech. This is significant because it would provide a more accurate picture of participants' voice use and allow for a more complete analysis of patient compliance. In the present study, patients report their daily maximum volume, but it is unclear how much they use their voice at that volume. For example, two hypothetical patients might both report

VAS scores of 8 with shouting as their maximum volume for a given day. Despite their matching reports, their actual voice use for that day could be substantially different (e.g., perhaps all of Patient A's voice use was shouting, while Patient B's voice use was primarily whispering with just a single, brief instance of shouting). Using an APM, it may be possible to track the amount of time that participants use their voices at various amplitudes and determine if and how amplitude should be considered when discussing compliance (i.e., is someone who whispers for 15 minutes more or less compliant than someone who shouts for 5 minutes?).

While the technical adaptations described above would reduce or eliminate the subjectivity of self-report and provide a more accurate indication of actual time and intensity of speech, they are not without their drawbacks. Some participants might find the APM cumbersome, and there may be limits to how much data they can record in a given day, how long they can record, and how frequently the data must be uploaded. It is also unclear if there is a TTS device available with the capacity to record time or frequency of use. Still, despite these limitations, it may be worth exploring more objective measurement options given the enrichment they may provide for expanded research.

Another limitation of this study was the use of an arbitrary cutoff point for the amount of voice use that would be indicative of compliance versus non-compliance. Conceptualizing compliance as a spectrum with an arbitrary cutoff of 25 mm was appropriate for the small number of subjects in the present study because we were largely interested in individual behavior. However, in a larger study with more participants, a more precise cutoff point grounded in research on vocal fold tissue responses to phonation and recovery from surgery should be utilized, if possible. In 2012, Suehiro, Bock, Hall, Garrett, and Rousseau found it feasible and practical to study acute healing of vocal folds following microflap incisions in a rabbit model. This research is an entry point for subsequent examination of the impact of varying durations of phonation on tissue recovery and on the optimal timing for resumption of

voice use following surgery. Indeed, researchers at Vanderbilt University are presently investigating these factors in a rabbit model, the results of which should be used to inform determination of an appropriate level of voice use to optimize tissue recovery.

It may be argued that the lack of an established baseline for post-surgical voice use behavior is a limitation of this study. This could be mitigated by introducing a crossover study design to the post-surgical period, as follows: 1) participants in the experimental group would receive the standard of care treatment for a specified period of time, thus establishing their baseline for post-surgical voice use; 2) participants would then be given a TTS device to use for a specified period of time; 3) participant access to the device would cease and standard of care treatment would be resumed. For example, in the case of a participant prescribed seven days of voice rest, the crossover model might consist of two days of standard of care treatment, three days of experimental treatment (i.e., device access), and two more days of standard of care treatment. This design would facilitate assessment of a treatment effect on a subject-by-subject basis, as variation in voice use between the experimental treatment period and the standard of care periods would highlight the impact of device access. Unfortunately, given the brief duration of the prescribed voice rest period (four to seven days), a crossover design was not feasible. For a participant on seven days of voice rest, two days each at the beginning and the end of the week is not enough time to establish a reliable baseline, nor is three days enough time to identify a treatment effect. Obviously, the crossover design would be even less reliable for participants on shorter periods of voice rest. Given the durational constraints of this study, analyses of group trends in voice use between the control and TTS groups appears to be the most effective design for identifying a treatment effect.

A final notable limitation of the present study is the impact of an “encouragement effect” that may play a role in compliance within the TTS group; that is, those participants who receive a device from study personnel may be more inclined to adhere to voice rest than those who do

not simply because medical or research personnel spend additional time and resources providing them with an explicit alternative to speech. One way to control for this effect would be to include a secondary experimental group whose members receive a low-technology AAC intervention, such as a dry erase board and markers. Doing so would not only allow for a comparison of high- and low-tech interventions to support compliance, but, if significant voice use differences were found between the TTS and dry erase board groups, it might be possible to rule out "researcher encouragement" as a factor that enhances or promotes compliance.

Conclusion

Despite the limitations outlined above, the present study provides some insight into the potential impact of TTS access on patient voice use following surgery, as well as useful information pertaining to the formulation of a more comprehensive study. As an initial examination of patient compliance with and the impact of AAC on voice rest—two areas in which minimal research has been conducted—this study indicates that more comprehensive research is both warranted and feasible, and highlights numerous considerations for future research.

While this study was solely concerned with patient compliance, a measure of voice outcomes would be a welcome addition to future research in this area, and could be incorporated relatively easily. All of the patients in this study completed the Voice Handicap Index (VHI) (Jacobson et al., 1997), which measures an individual's perception of his/her own voice from functional, emotional, and physical perspectives, prior to surgery. By having patients complete a post-surgical VHI once they resume normal voice use, trends and relationships in compliance with voice rest and post-surgical self-perception of voice and quality of life could be examined. As an alternative to or in conjunction with the VHI, patient voice outcomes could also be examined using some combination of pre- and post-surgical acoustic measurements,

stroboscopic evaluation, and/or professional perceptual assessment of voice using scales such as Grade, Roughness, Breathiness, Aesthenia, Strain (GRBAS) (Hirano, as cited by Karnell et al., 2007) or Consensus Auditory Perceptual Evaluation of Voice (CAPE-V) (Kempster et al., 2009).

By applying the lessons learned from the present study, continued research on compliance and voice rest outcomes has the potential to help identify benefits and limitations of voice rest as an agent of recovery from vocal fold pathologies and surgery.

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Appendices

Appendix A: Pre-surgical Voice Use Survey (All Groups)

The Vanderbilt Voice Care Center is performing a study to learn more about how patients communicate before and after undergoing vocal fold surgery. Your responses to the questions below are confidential and will not be shared with your physician.

Age: _____

Gender: ❒ male ❒ female

Are you a singer? ❒ yes ❒ no

Name: _____

Date of Birth: _____

Occupation: _____

Highest level of education completed: _____

Do you live alone? ___Yes ___No

If no, how many OTHER adults (18 years or older) do you live with? _____

How many children (17 years or younger) do you live with? _____

Participant Code: _____ (this code will be filled in by the study investigator)

Appendix A: Pre-surgical Voice Use Survey (All Groups)

Date: _____

Pre-Surgery DAY _____

Participant Code: _____

1) Please check the appropriate response:

_____ I worked/went to school today.
_____ I took the day off from work/school today because of my voice.
_____ N/A

2) Make a mark on the line between 0 and 10 to answer the following statement:

How much did you use your voice today (including whispering)?
I used my voice …

_____

0
Not at all

10
Every time I wanted to communicate

3) Circle the number that best describes the maximum loudness of your voice use today?

1	2	3	4	5
I did not use my voice	Whisper	Conversational level	Talking Loudly	Yelling

4) How did you communicate today? (check all that apply)

___ Voice ___ Mouthed words ___ Other (explain):

___ Whisper ___ Writing _____

___ Gesture ___Text/ Email _____

___ iPhone/Blackberry/Other smart phone ___ iPad/Other tablet pc

Appendix B: Pre-surgical Voice Use Survey (Control Group)

Date: _____

Post-Surgery DAY _____

Participant Code: _____

1) Please check the appropriate response:

_____ I worked/went to school today.
_____ I took the day off from work/school today because of my voice.
_____ N/A

2) Make a mark on the line between 0 and 10 to answer the following statement:

How much did you use your voice today (including whispering)?
I used my voice …

_____

0 — Not at all

10 — Every time I wanted to communicate

I was able to communicate effectively today without using my voice or whispering.

_____

0 — Not at all

10 — Every time I wanted to communicate

3) Circle the number that best describes the maximum loudness of your voice use today?

1	2	3	4	5
I did not use my voice	Whisper	Conversational level	Talking Loudly	Yelling

4) How did you communicate today? (check all that apply)

___ Voice ___ Mouthed words ___ Other (explain):

___ Whisper ___ Writing _____

___ Gesture ___Text/ Email _____

___ iPhone/Blackberry/other smart phone ___ iPad/Other tablet pc

Appendix C: Pre-surgical Voice Use Survey (TTS Group)

Date: _____

Post-Surgery DAY _____

Participant Code: _____

1) Please check the appropriate response:

_____ I worked/went to school today.
_____ I took the day off from work/school today because of my voice.
_____ N/A

2) Make a mark on the line between 0 and 10 to answer the following statement:

How much did you use your voice today (including whispering)?
I used my voice …

_____

0 10
Not at all Every time I wanted to communicate

I was able to communicate effectively today without using my voice or whispering.

_____

0 10
Not at all Every time I wanted to communicate

How much did you use the Lightwriter SL-40 device today instead of using your voice or whispering?

_____

0 10
Not at all Every time I wanted to communicate

3) Circle the number that best describes the maximum loudness of your voice use today?

1	2	3	4	5
I did not use my voice	Whisper	Conversational level	Talking Loudly	Yelling

4) How did you communicate today? (check all that apply)

___ Voice ___ Mouthed words ___ Lightwriter SL-40

___ Whisper ___ Writing ___Other (explain):

___ Gesture ___Text/ Email _____

___ iPhone/Blackberry/other smart phone ___ iPad/Other tablet pc

Appendix E: Expanded Survey (TTS Group)

Confidential

Expanded Survey - CON Group

Please complete the survey below.

Thank you!

Date: _____

Post-Surgery DAY _____

Participant ID: _____

Please answer the following questions as accurately and honestly as possible. Your answers will not be seen by your physicians or clinicians at the Vanderbilt Voice Center.

It was a challenge for me to communicate with others while I was on voice rest:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I interacted with people less than usual because I was on voice rest:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

Being on voice rest restricted my personal and social life:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I was unable to work while I was on voice rest:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

Being on voice rest frustrated me:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

Being on voice rest made me feel handicapped:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

It was an effort to get through my day while I was on voice rest:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I used my voice while on voice rest:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

Appendix E: Expanded Survey (TTS Group)

Please indicate which of the following tools/strategies you used most instead of speaking:

- ☐ Gesture
- ☐ Text Message
- ☐ Email
- ☐ Dry Erase Board/Marker
- ☐ Pen/Pencil and Paper
- ☐ Mouthed Words
- ☐ Lightwriter SL40
- ☐ iPad/Other tablet pc
- ☐ iPhone/Blackberry/Other smart phone
- ☐ Other

In general, when you are not on voice rest, how talkative of a person are you?

_____

0 **10**

If more space is needed, please use the back of this form to complete your answers.

Please tell us about your experience on this study. _____

Appendix E: Expanded Survey (TTS Group)

Confidential

Expanded Survey-TTS Group

Please complete the survey below.

Thank you!

Date: _____

Post-Surgery DAY _____

Participant ID

_____

Please answer the following questions as accurately and honestly as possible. Your answers will not be seen by your physicians or clinicians at the Vanderbilt Voice Center.

It was a challenge for me to communicate with others while I was on voice rest:

- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I interacted with people less than usual because I was on voice rest:

- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

Being on voice rest restricted my personal and social life:

- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I was unable to work while I was on voice rest:

- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

Being on voice rest frustrated me:

- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

Being on voice rest made me feel handicapped:

- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

It was an effort to get through my day while I was on voice rest:

- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I used my voice while on voice rest:

- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

Confidential

I used the Lightwriter at home:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I used the Lightwriter at work:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I used the Lightwriter in public:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I used the Lightwriter over the phone:
- ☐ Never
- ☐ Almost Never
- ☐ Sometimes
- ☐ Almost Always
- ☐ Always

I felt comfortable using the Lightwriter at home:
- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neither Disagree nor Agree
- ☐ Agree
- ☐ Strongly Agree

I felt comfortable using the Lightwriter at work:
- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neither Disagree nor Agree
- ☐ Agree
- ☐ Strongly Agree

I felt comfortable using the Lightwriter in public:
- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neither Disagree nor Agree
- ☐ Agree
- ☐ Strongly Agree

I felt comfortable using the Lightwriter over the phone:
- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neither Disagree nor Agree
- ☐ Agree
- ☐ Strongly Agree

Using the Lightwriter helped me avoid using my voice:
- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neither Disagree nor Agree
- ☐ Agree
- ☐ Strongly Agree

If I had to go on voice rest again, I would like to have a Lightwriter:
- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Neither Disagree nor Agree
- ☐ Agree
- ☐ Strongly Agree

Before my surgery, I practiced using the Lightwriter
- ☐ Not at all
- ☐ 0-1 hour
- ☐ 1-2 hours
- ☐ 2-3 hours
- ☐ 3-4 hours
- ☐ More than 4 hours

Appendix E: Expanded Survey (TTS Group)

Confidential

Please indicate which of the following tools/strategies you used most instead of speaking:

- ☐ Gesture
- ☐ Text Message
- ☐ Email
- ☐ Dry Erase Board/Marker
- ☐ Pen/Pencil and Paper
- ☐ Mouthed Words
- ☐ Lightwriter SL40
- ☐ iPad/Other tablet pc
- ☐ iPhone/Blackberry/Other smart phone
- ☐ Other

In general, when you are not on voice rest, how talkative of a person are you?

_____

0 **10**

If more space is needed, please use the back of this form to complete your answers.

Please tell us about your experience on this study. _____

Please tell us about your experience using the Lightwriter device. _____

If you were to be on voice rest again, would you want to use a text-to-speech device?

- ☐ Yes
- ☐ No

Please tell us why you would or would not choose to use a text-to-speech device in the future. _____

If you would not use a device again, why?

- ☐ Too high tech
- ☐ Too low tech
- ☐ Other: _____

If you would not use the Lightwriter again, would you use something else instead?

- ☐ Yes
- ☐ No

What would you use instead? _____

Getting Started with the Lightwriter SL-40

1. **To turn the unit on**, press the 'On/C' key on the top row of the device.

2. **To get attention quickly**,
   - Press the  key. The alarm will buzz/ring.

3. **To speak a message**:
   - When the menu appears, select '1' to select 'talk'
   - Type what you would like to say
   - Press the 'Do' button to speak the message

4. **To erase a letter or a few letters**
   - use the 'Back/←' key to erase letters one at a time

5. **To get to the activity bar/main menu quickly**
   - Use the '!' key

6. **To save a phrase**
   - Type in the phrase you'd like to save
   - Press "Menu"
   - Select "Save Phrase" (#1)

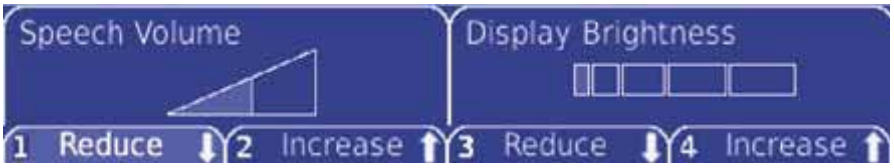
7. **To see a complete phrase list**
   - Press **"Pick"** key from a clear screen
   - Scroll through the list using the arrow keys

   To see a shorter phrase list

   i. Type in a key word or a few key letters of the phrase you want (Example: type in 'h' or 'how' for phrases that begin with the letter 'h' or the word 'how')
   ii. Press 'Pick'
   iii. You will see phrases containing the word(s) you typed in
   iv. To select a phrase, scroll through the list using the 'Next' and/or 'Back arrow keys
   v. Press 'Do' to select the phrase you want OR use the appropriate number key
   vi. To return to typing without making a selection press 'Pick' again
   vii. Press 'On/C' to get out of that menu

8. **To have the device speak one word at a time (rather than a sentence)**
    - Press "!" key to get into main menu/activity page
    - Select '7' (the wrench – which indicates 'setup')
    - Select '3' (lips/speech)
    - Select #1 – Speech Mode
    - Use the '➔' or '🡐'to select either 'word'
    - Select 'Do'

9. **To quickly adjust the volume/screen brightness in any menu**
    - Select '**shift ↑'** key (up arrow on bottom left of keyboard) **and the 'Menu'** key at the same time
    - See picture below of what screen will look like
    - Use the number keys or the arrow keys to increase or decrease on each setup
        - **Volume**: Select '1' to increase the volume; select '2' to decrease the volume
        - **Brightness**: Select '3' to increase the brightness; select '4' to decrease the brightness
    - Press **On/C** to save the setting and return to what you were doing



10. **Useful shortcuts:**
    - Some letters/numbers can be used instead of typing a whole word
    - R = are, B = be or bee, C = see/sea, U = you, 2 = to /two /too, B4 = before
    - Example: 'Nice 2 C U' = 'Nice to see you'

11. **To turn the unit off (if not going to be using it for an extended period of time).**
    - Press "!" key to get into main menu/activity page
    - Select '7' for setups
    - Select '7' (*light switch*)
    - Select '2' to "Power Off'
    - Select '1' to turn device off now.

12. **Charging the device:**
    - ♦ USE ONLY THE ADAPTOR FOR THIS DEVICE!
    - ♦ Be sure to plug adaptor into an electrical outlet (i.e., *not* into an extension cord).
    - ♦ Plug the adaptor into the jack on the left side of the device.
    - ♦ When the unit is charging, you will see a little green light beside the plug on the left side of the device.
    - ♦ Charge on a regular schedule – e.g., every night.
    - ♦ Low battery sign '■' will show onscreen if the battery is getting very low

13. **Things to remember:**
    - ♦ **DON'T get the device wet, or get food on it.**
    - ♦ If there is a problem with the device, please have someone call the following number: (615) 831-4638

Frequently Asked Questions (FAQs) about the Lightwriter SL-40

1) What is the Lightwriter used for?
It's used for communication. Anything that you would normally say can be typed and spoken by the Lightwriter. For example, "How are you?", "what's for dinner?", "where's the remote?"

2) When can I use the Lightwriter?
You can use the Lightwriter anytime you have something you want to communicate. You can also use the bell to get somebody's attention.

3) Can I use the Lightwriter to talk on the phone?
Yes, you can use the Lightwriter to talk on the phone. It's helpful to use a pre-stored message such as, "I'm using a device to speak. Please don't hang up on me", to let the person on the other end know that they should wait while you type.

4) Do I need a special phone to use the Lightwriter?
No, you don't need a special phone. It's best to use a speakerphone so that you don't have to juggle the Lightwriter and the phone receiver.

5) When should I charge the Lightwriter?
Charge the device every night.

Questions? Problems? Contact: 831-4638 OR kate.vonwahlde@vanderbilt.edu