ABSTRACT

THE IMPACT OF VIDEO MODELING AS SUPPLEMENTAL HOME PRACTICE INSTRUCTION ON VOICE THERAPY OUTCOMES

by Bethany Kathleen Clouse

The purpose of this pilot study is to examine the efficacy of video modeling as a means of supplemental instruction for home practice of Vocal Function Exercises (VFEs). Four participants between the ages of 18 and 21 were enrolled in the study. The control group received verbal instruction during the first therapy session and an audio recording of VFE protocol instructions for home practice. The experimental group received verbal instruction during the first therapy session, an audio recording of VFE protocol instructions for home practice, and a video recording of their first therapy session to use in conjunction with home practice. Data analysis examined number and complexity of instructional cues, laryngeal health and function (phonation, frequency range, and power average), and patient self-efficacy. Overall, the areas of most notable benefit of video modeling may be increases in adduction exercise phonation times; decreases in instructional cues, verbal cues, and total explicit instruction; and the maintenance of relative importance of voice therapy to the patient across sessions. The findings of this study may be useful for speech-language pathologists in regard to increasing patient adherence to the VFE home practice regimen.

THE IMPACT OF VIDEO MODELING AS SUPPLEMENTAL HOME PRACTICE INSTRUCTION ON VOICE THERAPY OUTCOMES

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CHAPTER I

Introduction and Review of the Literature

Within the field of speech-language pathology, the use of digital technology is increasing in the forms of telepractice and video modeling for home treatment programs. Multimedia technology has been increasingly utilized in educational and clinical settings (Toki, 2013). The increased use of technology within the practice of speech-language pathology may allow clinicians to provide therapy that is more adaptable and engaging to patients (Theodoros, 2012). One impetus for the use of multimedia technology in speech therapy is the expectation of younger generations to make use of technology in most aspects of their lives (Theodoros, 2012). Previous generations did not have access to the technology that is available today when they were growing up; however, younger generations are comfortable with and adept at using technology in their daily lives (Theodoros, 2012). Therapy approaches need to be malleable, allowing them to be easily individualized to meet the needs of the diverse populations served by speech-language pathologists (SLPs). Technology allows SLPs to provide this discrete and personalized intervention. Recent research into the efficacy of use of technology in speech therapy has provided support for its use with several populations, including: adult neurogenic communication disorders (Hill, Theodoros, Russell, & Ward, 2009; Palsbo, 2007), stuttering (Carey et al., 2010), dysphagia (Sharma, Ward, Burns, Theodoros, & Russell, 2011; Ward et al., 2009), and voice disorders (Mashima et al., 2003).

Learning Capacity through Multimodal Presentation

The cognitive load of learning any new task is determined by the design of the instruction and the modality in which it is presented (Sweller, 1994). In order to increase the efficiency of learning, it is important to examine the aspects of learning as well as aspects of instruction that may affect the learning of new tasks and behaviors. Working memory is limited in the volume of auditory and visual information that an individual can process at one time (Kirschner, 2001). When thinking in terms of the most efficient means of transmitting information with the hopes of knowledge retention, the stimulus presentation in relation to memory performance should be considered. It may be more important to consider the sensory modality through which the information is presented rather than to focus on the content that is to be remembered (Mastroberardino, Santangelo, Botta, Marucci, & Belardinelli, 2008).

There are several principles that explain the acquisition of knowledge and the learning of new information. The *modality* principle asserts that the most effective presentation of words occurs when given verbally as opposed to written text on a screen (Mayer, 2001). The *multiple representation* principle posits that the presentation of words in conjunction with pictures allows information to be retained more effectively than if the words are presented alone (Kirschner, 2001). The *dual code* theory asserts that there is an advantage to presenting information in a bimodal format (i.e., through a non-verbal subsystem and a verbal subsystem) because the stimuli are processed through two codes rather than a single code (i.e., unimodal presentation) (Mastroberardino et al., 2008). A study conducted by Constantinidou, Neils, Bouman, Lee, and Shuren (1996) found that when the examiners provided a visual representation of objects (both individually and with simultaneous auditory presentation), individuals with closed head injury were better able to learn the names of the objects than they were when presented verbally with the name alone.

Video Modeling

Video modeling was introduced to the practice of psychologists and educators in the early 1970s and was initially established to provide participants in therapy with a means to view themselves executing a target task or behavior at a higher level of performance than their typical ability (Buggey, 2005; Buggey & Ogle, 2012). A potential hypothesis behind presenting a participant with a video of themselves performing tasks correctly is that it may increase the attention of the participant to the video and the behavior or task being featured (Hosford, 1981). One variation of video modeling, video self-modeling, has proven to be effective as long as the individual has the ability to attend to the video (Buggey & Ogle, 2012). Video self-modeling involves an individual watching videos of him- or herself performing a learned task or demonstrating a target behavior (Marcus & Wilder, 2009).

Today the technique is used to teach a variety of tasks and behaviors in therapeutic and educational settings, including social behavior, speech, language, motor skills, behaviors associated with emotional disabilities, academic skills, and functional skills (Buggey & Ogle, 2012). In a review of 27 studies that examined the efficacy of video self-modeling, Meharg and Woltersdorf (1990) reported significant gains in target behaviors that generalized across settings and conditions. It was also found that these gains endured beyond the period of intervention

(Meharg & Woltersdorf, 1990). Video self-modeling has also been found to be an effective teaching technique for a variety of populations, behaviors, and ages (Buggey & Ogle, 2012).

Video modeling is currently commonly used among children with autism spectrum disorders (ASD) as a means of implementing specific behaviors or diminishing negative behaviors that can be generalized from clinical treatment to home practice (Plavnick, MacFarland, & Ferreri, 2015). The significance of these findings is that this may help solve the common issue of inconsistent generalization of newly acquired skills (for typical populations as well as for individuals with ASD) when acquiring new tasks given traditional prompting and reinforcement (Charlop-Christy, Le, & Freeman, 2000).

There is building evidence for the effectiveness in the following behaviors in the ASD population: conversational speech, perspective taking, affective responding, reciprocity in play, pretend play, self-care skills, toilet skills, social skills, language skills, functional living skills, and social initiations (Acar & Diken, 2012; Plavnick et al., 2015; Wilson, 2013). In a study comparing the teaching of behaviors through video modeling and live modeling in children with ASD, 4 of the 5 children acquired the target behaviors more quickly and effectively when taught through video models (Charlop-Christy et al., 2000). Possible reasons for the efficacy of video modeling when used in teaching a child with ASD may be increased independence of the child, possibilities for individualized videos to meet specific needs, consistency of lesson implementation, and consistency across settings as well as care providers (Wilson, 2013).

Clinical Voice Therapy

Voice disorders are identified when the voicing requirements of an individual are not being met as a result of dysfunction or structural abnormalities of the laryngeal mechanism (Stemple, Glaze, & Klaben, 2010). One in 13 adults in the United States is affected by voice disorders annually (Bhattacharyya, 2014). In addition, a study completed by Roy, Merrill, Gray, and Smith (2005) reported that there is a 29.9% lifetime prevalence for voice disorders that exists among the adult population. Several therapy approaches target improvement of voice disorders, including symptomatic, physiologic, psychogenic, etiologic, and eclectic voice therapies (Stemple, Lee, D’Amico, & Pickup, 1994).

Vocal Function Exercises. Vocal Function Exercises (VFEs) are a physiologic therapy approach designed to improve the strength, endurance, and coordination of the subsystems of speech (i.e., respiration, phonation, and resonance) in order to restore balance between them

(Roy et al., 2001; Stemple et al., 1994). The exercises focus on altering the function of the laryngeal mechanism in order to increase muscle strength, tone, balance, and stamina (Stemple et al., 1994). Improved laryngeal function is responsible for balancing the subsystems of voice, including muscle activity in the larynx, balanced airflow, and placement of the tone above the glottis (Wrycza Sabol, Lee, & Stemple, 1995).

VFEs require the patient to perform four particular exercises (the fourth of which involves a series of five, ascending, mid-range pitches) two times each, twice daily, for 6-8 weeks (Roy et al., 2001). The VFE treatment protocol includes a home practice component. An audio recording of the instructions for and modeling of the exercises is generally part of the protocol for required home practice (Roy et al., 2001).

Efficacy of VFE. The efficacy of VFEs has been well-documented in the literature and has been found to improve voice quality and laryngeal function both in disordered and typical voice users. In a study completed by Stemple et al. (1994), integration of VFEs into daily routine was found to significantly improve phonation volume, flow rate, maximum phonation time, and frequency range in a group of women with typical voices as compared to the control group, who performed daily placebo vocal exercises. A study conducted by Wrycza et al. (1995) examined the impact on aerodynamic measures (i.e., flow rate, phonation volume, and maximum phonation times) as a result of integrating VFEs into the practice regimen of healthy singers. The study found that VFEs significantly improved each of the aerodynamic measures by modifying and strengthening the overall function of the laryngeal mechanism, resulting in greater vocal efficiency (Wrycza et al., 1995).

In addition to evidence for use of VFEs in the improvement of laryngeal health and function, the efficacy of VFE in comparison to other voice therapy approaches has been examined in the literature. Roy et al. (2001) found that when compared to a vocal hygiene regimen, individuals who completed a VFE program reported a greater overall voice improvement and significantly greater ease and clarity of voice following treatment. While gains were still noted by the vocal hygiene group, it is suggested that VFEs should be prescribed as an alternative or to be completed in conjunction with a vocal hygiene regimen in the effective treatment of voice disorders (Roy et al., 2001). Another study by Pasa, Oates, and Dacakis (2007) examined the use of VFEs as a preventative measure of voice disorders in teachers. The study determined that when added to the teachers' daily routines, improved voice knowledge and use of VFEs reduced symptoms of vocal misuse, increased maximum phonation time, and increased maximum frequency range while the control group demonstrated deterioration in these variables (Pasa et al., 2007).

While VFEs have been proven to be highly effective in the improvement of laryngeal health and function as well as prevention of voice disorders in a variety of populations, the exercise components are somewhat novel tasks for some individuals. In order to address the best means to introduce and train such unfamiliar endeavors in the assessment and treatment of voice disorders, current research is examining the efficacy of using video modeling. Werner (2015) found that the process of learning new tasks can be facilitated by the use of multimodal platforms (i.e., training videos). Use of video models in the study demonstrated increased efficiency in voice assessments secondary to a decrease in the load of cognitive and working memory required to perform novel tasks (Werner, 2015). The effectiveness of video modeling has also been documented when used in conjunction with resonant voice therapy by van Leer and Connor (2012).

Statement of the Problem/Purpose of the Study

The tasks included in the VFE protocol are specific and novel for first-time participants in voice therapy. There is a learning curve associated with implementing VFEs into a home practice regimen and a time period over which the participants must learn to correctly complete the exercises on their own. Because the participants only receive instruction and modeling during their weekly therapy sessions, this can delay correct implementation of the exercises and prolong the participant's progress in therapy. In order to decrease the learning period and increase the efficiency with which the participants are able to correctly implement the exercises in home practice, cognitive load and working memory requirements related to learning new tasks must be considered.

The purpose of the present study was to explore the possible efficacy of utilizing video modeling in the context of VFEs as a treatment paradigm for patients who have been diagnosed with voice disorders. Individuals may feel uncertain about how to carry out practice tasks at home and may be assisted by having a video model in conjunction with the provided audio recording available for daily practice. Although individualization in terms of goal setting does not necessarily apply to implementation of VFEs, it may be possible that the other benefits of video modeling outlined by Wilson (2013) that assist the ASD population (e.g., increased independence, consistency of implementation, and consistency across settings) may benefit patients with voice disorders in their learning and use of VFEs as part of the prescribed treatment regimen. Video modeling techniques may have great potential in the treatment of voice disorders. The present study will expand on these findings and seek to determine efficacy of the role of video modeling in treatment of voice disorders.

This pilot study was designed to investigate the impact of including video modeling in a typical voice therapy regimen as measured by laryngeal health as well as number and complexity of instructional cues. The study also addressed participant report concerning confidence in the therapy program and their own adherence to home practice exercises. The current study hoped to answer the following research questions:

1. When incorporated into the protocol for home practice with VFEs, does use of video modeling contribute to improved therapy outcomes? How can this contribution best be measured?
2. Will participants require fewer and less complex instructional cues over the course of the first 3 therapy sessions when provided with video modeling to aid home practice?
3. How will the use of video models in conjunction with the VFE protocol affect overall laryngeal health and function as determined by power averages and frequency ranges?
4. Will participants report greater self-efficacy when provided with video models for home practice?

CHAPTER II

Methods

Participants

Four adult female participants with a mean age of 18.75 years (range=18-21 years) were recruited for this study. All participants who were recruited were treatment-seeking patients at the Miami University Speech and Hearing Clinic. A simple randomization procedure was executed to determine experimental and control group assignments.

Participants were enrolled in voice therapy to remediate voice problems. Diagnoses included laryngeal myasthenia and dysphonia (characterized by breathy hoarseness). Both experimental participants reported a history of voice problems they attributed to allergies and were both taking medication for allergies at the beginning of the study. Experimental Participant 1 also reported a recent episode of laryngitis, occurring approximately 2 months prior to the beginning of the study. All participants were involved with singing, either through a vocal performance major or private voice lessons.

Criteria for participation. For inclusion in the study, participants were required to be examined by a licensed, certified speech-language pathologist and referred by a licensed physician. A diagnosis of a voice disorder by a licensed physician through laryngeal exam was required for inclusion. Recruited participants for the study were excluded if self-report measures indicated a history of any of the following: smoking, previous instruction or participation in VFEs, current respiratory disease (e.g., asthma, cystic fibrosis), current neuromuscular disease (e.g., multiple sclerosis), learning disability, or hearing loss due to the potential influence on vocal functioning.

Procedure

Patients having voice problems are referred to the Miami Speech and Hearing Clinic either by a physician, voice teacher, or self-referral for a voice evaluation. Patients who are diagnosed with a voice disorder must have a physician referral prior to receiving voice therapy. The referring physicians were not affiliated with the current study. Vocal Function Exercises are recommended as a standard treatment for voice disorders and were prescribed prior to referral to the researcher. As such, participants were responsible for payment of the treatment.

Patients referred for voice therapy received information about the study during treatment scheduling. Interested participants were instructed to contact the primary investigator via phone or email for more information about the study. In addition, permission was obtained from the participants for the clinic to provide contact information to the researchers. No diagnostic or other personal information was shared at that time.

The research took place in the Clinical Voice Laboratory in Miami University Speech and Hearing Clinic.

Informed consent. Each participant was provided with written documentation of informed consent explaining the purpose of the study and each task necessary to participate. The research assistant reviewed the document with the participant, and the participant was provided with sufficient time to read the document and ask relevant questions. Through the written information and verbal explanation, the participants were informed that participation was entirely voluntary and that they had the right to withdraw from the study at any time without penalty to themselves. Participants signed the informed consent documentation and were provided a copy of the documents for their own record.

Voice therapy exercise protocol. Following the determination of qualification of inclusion in the study and agreement of the subjects to participate in the study, the subjects met with the supervising clinician (a certified, licensed speech-language pathologist) during their regularly scheduled therapy session for instruction of the VFE protocol. The initial session was used to analyze the participant's pitch range in order to determine the range of notes to be used in the protocol. This analysis was followed by instruction of the VFE exercise protocol. The VFE protocol consists of four discrete exercises that serve to coordinate and strengthen the laryngeal mechanism. The participants learned and completed each part of the exercise protocol as follows: (1) vocal warm up (sustained vowel production), (2) vocal pitch glides from high to low (stretching exercise), (3) vocal pitch glides from low to high (contracting exercise), and (4) vocal fold adduction exercise on five different successive musical notes.

Home practice protocol. Within the initial voice therapy session, the participants were provided with a VFE log (Appendix A) and instructed to continue completing the exercises outside of therapy. Participants were instructed that the VFE protocol was to be completed twice per day and each exercise was to completed two times each. The VFE log was used to record the maximum phonation time (in seconds) of each exercise in the protocol as well as the date and time they were completed. The log was collected and documented at each of the first three therapy sessions.

Adherence measures protocol. Participants were asked to complete a Readiness Ruler "Self-Efficacy for Voice Therapy" Likert scale (Appendix B) adapted from van Leer and Connor (2012) to measure their self-efficacy at the beginning of the first three sessions. The measures were taken at baseline and during the two subsequent therapy sessions. Included were questions related to the participant's confidence in the therapy program and potential voice improvement; their confidence in their ability to complete the home practice regimen and their certainty that they would be able to complete the exercises during various circumstances (i.e., when they are busy or tired); and their commitment to the voice therapy program and the relevant importance of this program to other priorities. The participants were encouraged to strive to extend their phonation times during their home practice and that progress with therapy is partially measured by an increase in maximum phonation times.

Testing protocol: Control group. Instruction during the initial therapy session and the following two therapy sessions was video recorded. Verbal instruction and modeling was provided by the treating therapist during each therapy session. The participants received a VFE log and an audio recording for use with home practice as part of the VFE therapy protocol. The participants were encouraged to strive to extend their phonation times during their home practice and that progress with therapy is partially measured by an increase in maximum phonation times.

Testing protocol: Experimental group. Participants in the experimental group received a video recording of their initial therapy session. The treating therapist provided verbal instruction and modeling during each therapy session. The video of this initial instruction was transferred directly to the participant's personal computer or electronic device for convenient, secure access. The participant was instructed to use the video during home practice as a personalized guide to completing the prescribed exercises. With this video, the participants were given access to the cues they were given in the initial therapy session to facilitate proper production of the exercises and augment their overall therapy experience.

Instructional cues measurement. Video recordings of the first three therapy sessions for both the experimental and control participants were analyzed by two independent raters. The exercise protocol was explained to the raters and they were trained on how to determine the type and complexity (verbal instruction; visual instruction; verbal model; visual model) of instructional cues used during the therapy session. The raters then independently watched the recordings and tallied the cues by type and complexity to establish inter-rater reliability. One of the raters watched the videos and tallied cues a second time in order to assess intra-rater reliability.

Analysis of Data

Due to the small sample size of this pilot study, descriptive statistics were used to analyze the data. The primary dependent variables included power averages (measured in seconds) of adduction exercises as a measure of laryngeal health; instructional cues (number and ratings of complexity); and adherence (number of home practice sessions completed and ratings of self-efficacy). Spearman's Rho analyses were completed to assess inter and intra-reliability of ratings of instructional cues by the independent raters. Real-time Pitch Software (Pentax Medical) was used to obtain fundamental frequencies and maximum phonation time measurements. Power averages were calculated for each therapy sessions.

CHAPTER III

Results

Results listed below are organized by laryngeal health and function, instructional cues, and ratings of self-efficacy. Statistical significance was not assessed, due to the limited data in this pilot study.

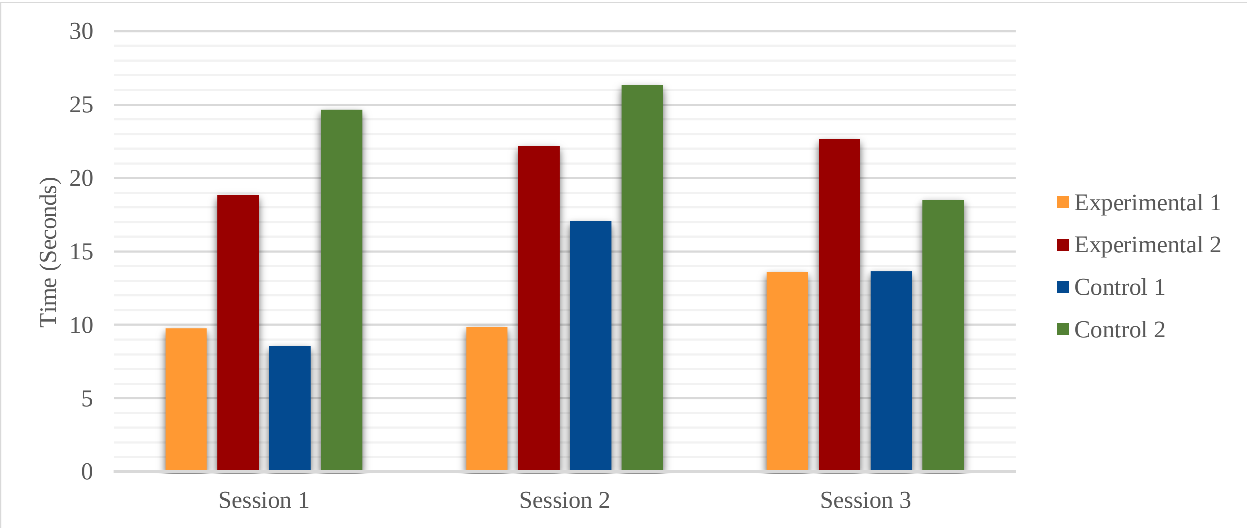
Laryngeal Health and Function

For laryngeal health and function, comparisons were made between mean values of VFE trials (Trial 1 and Trial 2, where participants completed 2 trials of each exercise during each session) of stretching, contraction, and adduction exercise power averages.

Power averages of adduction exercises. Mean values were taken from Trial 1 and Trial 2 of the VFE adduction exercises during each session (Figure 1). Comparisons of means indicate that the experimental group exhibited greater increases in adduction exercise phonation times as compared to participants in the control group.

Figure 1

Adduction Power Averages Across Sessions



Changes in frequency across sessions. Mean values were taken from the fundamental frequencies of Trial 1 and Trial 2 of the VFE stretching and contraction exercises for each session (Figure 2; Figure 3). Visual inspection of the data reveals that all participants made changes in frequency during these exercises as expected as a result of completing VFEs in home practice. Inspection of the data reveals that the upper limits of the phonatory frequency ranges decreased for Experimental Participant 1 and Control Participant 2 from Session 1 to Session 3. Experimental Participant 2 and Control Participant 1 experienced increases in the phonatory frequency range. For contraction exercises, only Experimental Participant 2 experienced decreases in the lower end of their frequency range from Session 1 to Session 3. Experimental Participant 2 was the only subject to exhibit increases in phonatory frequency range in both upper and lower limits.

Figure 2

Fundamental Frequency During Stretching Exercises Across Sessions

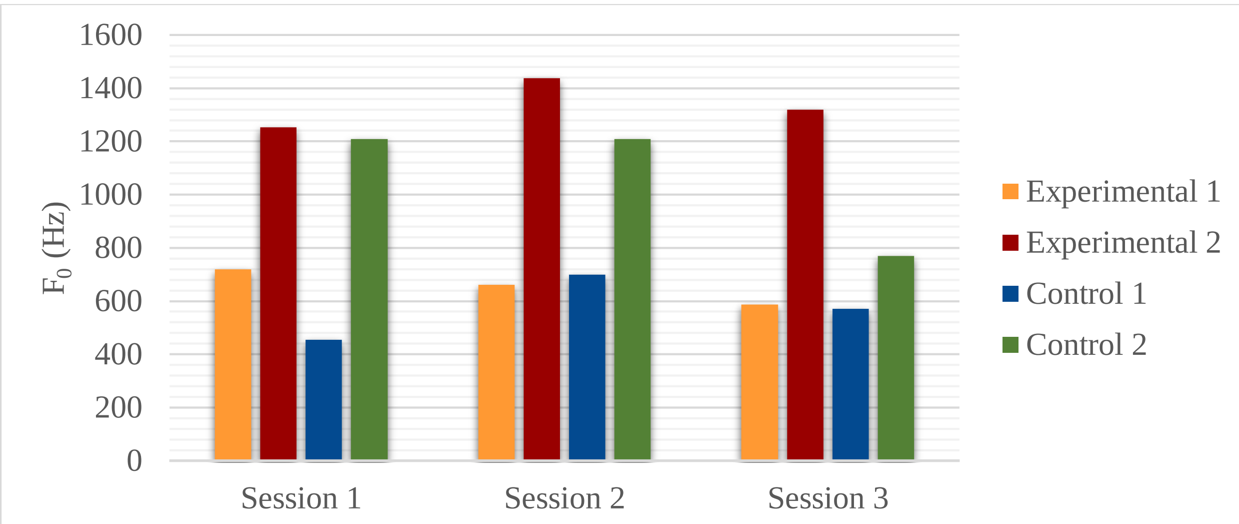
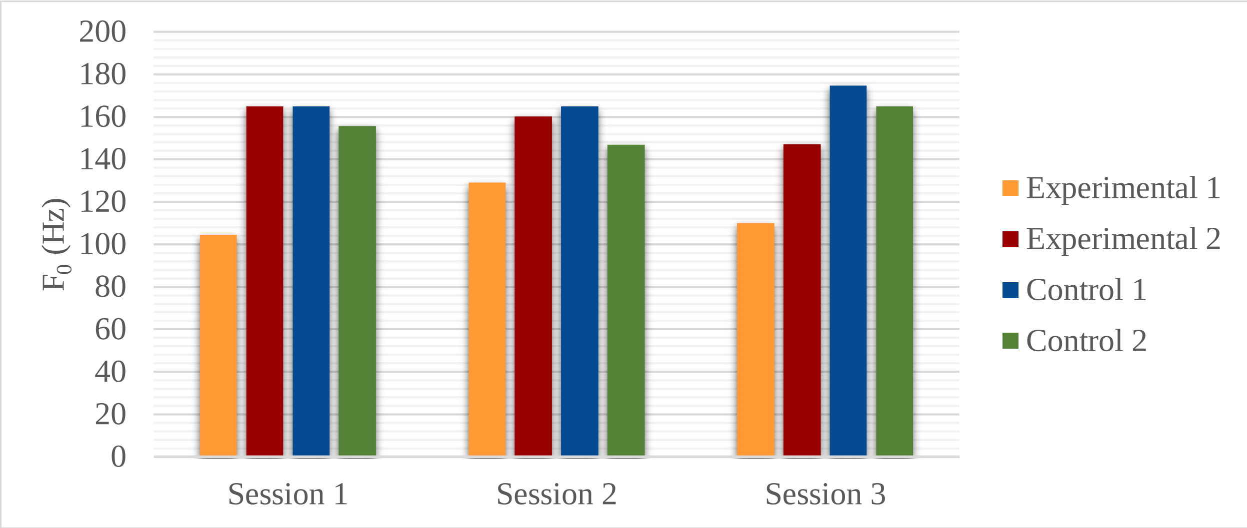


Figure 3

Fundamental Frequency During Contraction Exercises Across Sessions



Instructional Cues

Independent raters tallied the number of instructional cues (mean averages of raters' tallies were calculated) given during a therapeutic session as well as the complexity of the cues (e.g., verbal instruction, verbal modeling, visual instruction, visual modeling).

Due to a technical difficulty, the second half of the video for Control Participant 1's third session was not able to be analyzed for instructional cues. The iPad® recording the session ran out of memory halfway through the session and failed to record past the first adduction exercise. This situation poses a potential area of concern in terms of using video models in a clinical setting. It is vital to the process of using video models in the clinical setting that the technological equipment be checked regularly to ensure proper recording and to have an alternative plan in place in the event that the technology does not record the content correctly.

Because of the technical difficulty, a comparison of the instructional cues differences between the first and second sessions has been made for this participant. Analysis of Control Participant 1's data through the first adduction exercise of the third session (marker of occurrence of technical difficulty) suggests that she was following a similar pattern to the other control group participant.

Number of cues. Mean values were calculated of the total number of instructional cues required for each participant during each therapy session (Figure 4; Table 1). Both experimental participants experienced decreases in the number of instructional cues required across the first three therapy sessions. The differences in number of cues for Control Participant 1 between the first and second sessions and those for Control Participant 2 between the first and third sessions are very similar. On the other hand, smaller differences in number of cues were exhibited by both control participants as compared to the participants in the experimental group, meaning that the experimental group required fewer total instructional cues in subsequent therapy sessions than the control group. Lastly, a comparison of number of cues between sessions does not reveal a pattern among participants (Table 1). All but one participant (Experimental Participant 2) required fewer cues between Sessions 1 and 2.

Figure 4

Total Instructional Cues Across Sessions

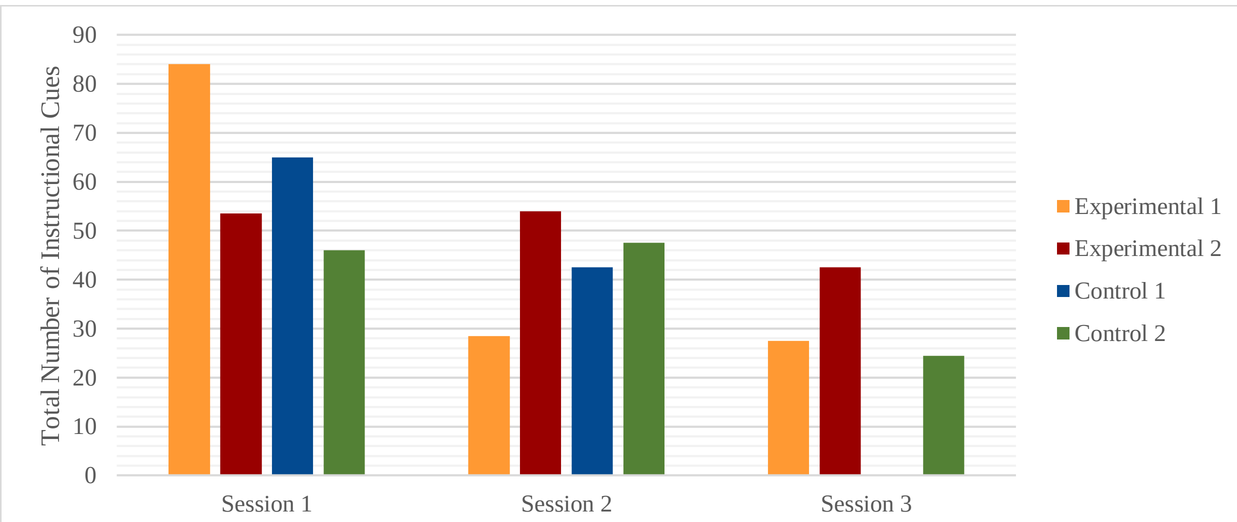


Table 1

Total Instructional Cues Across Sessions

Participant	Session 1	Session 2	Session 3	S1 vs. S2	S1 vs. S3
Experimental 1	84	28.5	27.5	55.5	56.5
Experimental 2	53.5	54	12.5	-0.5	41
Control 1	65	42.5		22.5	
Control 2	46	37.5	21.5	8.5	24.5

Ratings of complexity. For the purposes of this study, it is surmised that verbal cues are relatively more complex as compared to visual cues. Mean values were calculated for the total number of verbal cues required for each participant across the first 3 therapy sessions (Table 2).

Both experimental group participants required fewer verbal cues in Session 3 as compared to Session 1. Control Participant 2 also required fewer verbal cues by Session 3; however, the difference was not as great as the experimental group. Control Participant 1 followed a similar pattern from Session 1 to Session 2 as Control Participant 2 from Session 1 to Session 3. This suggests that video modeling may have a positive effect on the number of verbal cues required within therapy.

Table 2

Total Verbal Cues Across Sessions

Participant	Session 1	Session 2	Session 3	S1 vs. S2	S1 vs. S3
Experimental 1	57.5	19.5	22	38	35.5
Experimental 2	37	31	8	8	29
Control 1	38.5	27		11.5	
Control 2	27	22.5	17	4.5	10

Mean values were calculated for the total number of visual cues required for each participant across the first 3 therapy sessions (Table 3). Visual inspection of the data reveals limited differences between number of visual cues between sessions for the experimental group as compared to the control group. Visual inspection of individual differences reveals that Experimental Participant 1 from the experimental group had the largest difference between Sessions 1 and 2 as compared to the other participants. However, the other experimental participant had similar results to the control group participants.

Table 3

Total Visual Cues Across Sessions

Participant	Session 1	Session 2	Session 3	S1 vs. S2	S1 vs. S3
Experimental 1	26.5	9	5.5	17.5	21
Experimental 2	16.5	23	4.5	12	12
Control 1	26.5	15.5		11	
Control 2	19	15	4.5	4	14.5

Mean values were calculated for the total number of explicit instructional cues required for each participant across the first 3 therapy sessions (Table 4). The differences between sessions of numbers of explicit instructional cues made by the experimental group were substantially greater than those made by the control group.

Table 4

Total Number of Explicit Instructional Cues Across Sessions

Participant	Session 1	Session 2	Session 3	S1 vs. S2	S1 vs. S3
Experimental 1	68.5	24.5	26	44	42.5
Experimental 2	41.5	40	9.5	1.5	32
Control 1	44.5	34		10.5	
Control 2	37	30.5	19.5	6.5	17.5

Mean values were calculated for the total number of modeling cues required for each participant across the first 3 therapy sessions (Table 5). Visual inspection of the data reveals little variation between the experimental group and the control group. As compared to the other participants Experimental Participant 1 demonstrated the greatest difference in the amount of modeling required. Differences for Experimental Participant 2 are similar to Control Participant 2.

Table 5

Total Number of Modeling Cues Across Sessions

Participant	Session 1	Session 2	Session 3	S1 vs. S2	S1 vs. S3
Experimental 1	15.5	4	1.5	11.5	14
Experimental 2	12	14	3	-2	9
Control 1	20.5	8.5		12	
Control 2	9	7	2	2	7

Reliability. Inter- and intra-rater reliability were calculated using Spearman's Rho to assess the consistency between and within raters' tallies of number of instructional cues and complexity of cues. For both intra- and inter-rater reliability, the Spearman correlation indicates the data show a strong positive trend (r_s =0.9).

Readiness Ruler

Ratings of self-efficacy were gathered through a Readiness Ruler "Self-Efficacy for Voice Therapy" Likert scale collected at the beginning of every therapy session.

Self-efficacy for therapy outcomes. Ratings of self-efficacy for therapy outcomes were gathered from Questions 1 and 2 of the Readiness Ruler ("*How confident are you that your voice will improve with voice therapy?" "How confident are you in the voice therapy program you have chosen?").* The Readiness Ruler is a 10 point Likert scale. These data are displayed in Table 6. Both the experimental and control groups appear to be similarly confident in the efficacy of therapy outcomes throughout the first 3 sessions with no discernible deviation in either direction.

Table 6

Self-Efficacy for Therapy Outcomes

Participant	Session 1	Session 2	Session 3	S1 vs. S3
Experimental 1	9	9.5	10	1
Experimental 2	9	10	10	1
Control 1	8	8.5	9	1
Control 2	10	9.5	10	0

Self-efficacy for compliance. Ratings related to self-efficacy for compliance were gathered from Questions 3 and 6a-6f of the Readiness Ruler ("*How confident are you that you will practice voice therapy exercises twice daily"? "How certain are you that you are capable of practicing your voice exercises twice daily given a variety of situations (i.e., you are busy, tired, traveling)?"*). These data are displayed in Table 7. Data for all participants demonstrates increasing ratings of self-efficacy across sessions.

Table 7

Self-Efficacy for Compliance

Participant	Session 1	Session 2	Session 3	S1 vs. S3
Experimental 1	6.57	8.43	8.43	1.86
Experimental 2	9.29	9.14	9.57	0.28
Control 1	5.86	7.21	7.57	1.71
Control 2	7.57	8.14	7.86	0.29

Goal commitment. Ratings related to self-efficacy for goal commitment were gathered from Question 4 of the Readiness Ruler ("*How committed are you to this goal?*"). These data are displayed in Table 8. Visual inspection of the data indicates that 2 of the 4 participants rated their commitment as increasing by one rating point between Sessions 1 and 3; whereas, ratings did not change for one control participant (Control Participant 2). Interestingly, Experimental Participant 2 exhibited a decrease in goal commitment (-1) across sessions.

Table 8

Goal Commitment

Participant	Session 1	Session 2	Session 3	S1 vs. S3
Experimental 1	8	9	9	1
Experimental 2	10	9	9	-1
Control 1	7	8	8	1
Control 2	10	9	10	0

Relative importance. Ratings related to self-efficacy for relative importance were gathered from Question 5 of the Readiness Ruler ("*How important is this goal compared to other things you have to accomplish this week?*"). These data are displayed in Table 9. Data for the experimental participants reveal no increases in relative importance of voice therapy between Sessions 1 to 3. For one of the control group participants, the scale reported a decrease in 3 Likert points for this area.

Table 9

Relative Importance

Participant	Session 1	Session 2	Session 3	S1 vs. S3
Experimental 1	8	8	8	0
Experimental 2	9	8	9	0
Control 1	7	8	8	1
Control 2	9	8	6	-3

CHAPTER IV

Discussion

The purpose of this study was to examine objective measures of mean phonation times and phonatory frequency range, number and complexity of instructional cues, and subjective assessment of participant confidence in treatment, motivation, self-efficacy, and practice frequency during weekly in-person treatment sessions with and without a video model.

Laryngeal Health and Function

Researchers hypothesized that individuals who viewed a video model in addition to completing the traditional VFE home practice regimen would demonstrate improved laryngeal function as measured by increased power averages and increased frequency ranges compared to those who only received the audio recording of VFE instructions typically given as part of the VFE protocol.

Power averages of adduction exercises. Power averages of adduction exercises were determined by calculating the average of the longest time (in seconds) that phonation could be sustained between each trial of the adduction exercises. Findings indicated that those who viewed the video model during home practice exhibited an increase in phonation time during adduction exercises from Session 1 to Session 3 compared to those who did not have the home video model.

An interesting finding was that both control group participants experienced an increase in sustained phonation time from Session 1 to Session 2. However, both of these participants also experienced a decrease in sustained phonation time between Session 2 and Session 3. Another interesting finding is that for Control Participant 2, not only was there a decrease from Session 2 to Session 3, but this decrease was substantial enough to indicate a decrease in sustained phonation time from Session 1 to Session 3. There is currently no evidence to explain this decrease in power averages among the control group participants.

Changes in frequency across sessions. Changes in frequency during the stretching exercises were measured by real-time Pitch software (Pentax Medical). Findings indicated that those who viewed the video model during home practice did not experience marked increases in frequency range compared to those who did not have the home video model.

During the stretching exercises, Experimental Participant 1 and Control Participant 2 experienced decreases in the upper part of their frequency range from Session 1 to Session 3.

During the contraction exercises, Experimental Participant 1, Control Participant 1, and Control Participant 2 demonstrated increases in the lower part of their frequency range from Session 1 to Session 3. These findings were not expected after practicing VFEs. Only Experimental Participant 2 experienced expansion of the phonatory frequency range in both upper and lower limits between Session 1 and Session 3. Currently, there is no evidence to support the assertion that any of these changes are directly related to the implementation of video modeling into the VFE home practice regimen. Changes exhibited in stretching and contraction exercises may also be explained by external factors such as hydration or vocal fold edema. Anecdotal evidence suggests that allergies, laryngeal and oral dryness as a result of medication, and hydration levels may have played a role in these changes in frequency range among experimental and control participants. Further research may be necessary to investigate the influences of external factors as a possible explanation for changes made in frequency range in comparison to changes made as a result of video modeling in conjunction with the VFE protocol.

Instructional Cues

Researchers hypothesized that individuals who viewed a video model in addition to completing the traditional VFE home practice regimen would require fewer and less complex instructional cues by the third therapy session when compared to those who did not view a video model during home practice. For the purpose of this pilot study, instructional cues include any additional instruction provided by the clinician during the session, including visual cues, verbal cues, instruction, and modeling.

Number of cues. Number of cues was determined by two assistant raters who made tallies while watching the video recording for each session. Both experimental participants experienced decreases in the number of instructional cues required across the first three therapy sessions. The differences in number of cues for Control Participant 1 between the first and second session and those for Control Participant 2 between the first and third session are very similar. On the other hand, smaller differences in number of cues were exhibited by both control participants as compared to the participants in the experimental group, meaning that the experimental group required fewer total instructional cues in subsequent therapy sessions than the control group. Lastly, comparisons of number of cues between sessions does not reveal a pattern among participants. All but one participant required fewer cues between Sessions 1 and 2.

This preliminary evidence may suggest that the incorporation of video modeling into home practice for VFEs decreases the total number of instructional cues that participants require across the first three therapy sessions and consequently increasing the efficiency of the learning process and expediting success in therapy. It is important to consider the manner in which information is presented in regard to the learning of new therapy tasks. When considering the cognitive load required by a certain task, the design and presentation of the information can be adapted in order for the participant to learn the new task most effectively (Kirschner, 2001). As Sweller (1994) proposes, if more than one modality is targeted in the presentation of new information, working memory is not as heavily relied upon for the successful learning of that information. Increasing the number of modalities targeted in learning a new task has the potential to decrease the cognitive load that is associated with learning a new task (Sweller, 1994). The research findings of the current study support the assertion that if the instruction for a novel therapy task is presented through simultaneous visual and verbal presentation, the cognitive load associated with the learning of the new task and demands on working memory will decrease. This reduction of cognitive load can result in increased efficiency of participation in therapy tasks. In the current study, this assertion is supported by the fact that the experimental group participants appeared to require fewer total instructional cues by the third therapy session than the control group participants.

Ratings of complexity. Ratings of complexity were also determined by the assistant raters while watching the recorded sessions. The raters recorded the number of visual cues, verbal cues, explicit instructional cues, and modeling cues that were required within each session.

Visual inspection of the data reveals limited differences between the number of visual cues between sessions for the experimental group as compared to the control group. The greatest difference in number of visual cues between sessions is demonstrated by Experimental Participant 1. The other experimental participant (Experimental Participant 2) exhibited minimal differences in the number of visual cues between sessions. These results were more similar to the minimal differences also made by both control group participants. This may suggest that video modeling may not have a considerable effect on the number of visual cues required by the participants within each therapy session.

Based on a simple comparison of means, both experimental group participants required fewer verbal cues in Session 3 as compared to Session 1. Control Participant 2 also required fewer verbal cues by Session 3; however, the difference was not as great as the experimental group. Control Participant 1 followed a similar pattern from Session 1 to Session 2 as Control Participant 2 from Session 1 to Session 3. This suggests that video modeling may have a positive effect on the number of verbal cues required within therapy.

Visual inspection of the data reveals that there are larger differences in the number of explicit instructional cues required by the experimental group than the control group across therapy sessions. This means that the experimental group required fewer instructional cues than the control group as a result of using video modeling in conjunction with home practice.

A simple comparison of means reveals that there are minimal differences between the number of modeling cues required by both the experimental and control group participants. The most remarkable difference in the number of modeling cues required was made by Experimental Participant 1. However, the other experimental participant demonstrated minimal differences in the amount of modeling required. This may suggest that video modeling may not have a considerable effect on the number of modeling cues required across therapy sessions.

Readiness Ruler

The researchers hypothesized that participants would report greater confidence in treatment, motivation, self-efficacy, and practice frequency when given a video model for home practice. Both the experimental and control groups appear to be similarly confident in the efficacy of therapy outcomes throughout the first 3 sessions with no discernable trends in either direction. The data reflects that all participants appeared to experience an increase in their confidence in their own ability to continue to complete the VFE home practice exercises as recommended. This may speak to an increase in self-efficacy in therapy compliance as a result of VFEs themsevles when implemented in voice therapy, but a statement cannot currently be made about the role of video modeling in this increase. Both groups appear to be similarly committed to continuing home practice exercises in order to improve voice quality. Both of the experimental participants maintained the level of relative importance of voice therapy they had initially reported. For one of the control group participants, the scale reported a decrease in 3 Likert points for this area. While this change does not suggest that the inclusion of video models in home practice for VFEs increases the importance of voice therapy for patients, it may suggest that this inclusion prevents a decrease in relative importance that may occur with patients when not offered a video model.

Limitations and Future Directions

Limitations of the present study relate to the lack of control over the participants' home practice regimen as well as the demographic representation of the participants. The present study could not control for the participants' adherence to the VFE protocol in home practice, use of video models in home practice sessions, or technique used in home practice. The present study examined the use of video modeling and VFEs in a population with a lack of gender representation and limited age range.

Data obtained from this study may be used as a basis for future research on the use of video modeling within home treatment programs. It may be beneficial to examine these results in relation to more data concerning the use of video modeling with the VFE home practice regimen as well as with other aspects of voice therapy and eventually in the treatment of other disorders within the field of speech-language pathology. Future studies of this type may wish to implement data-tracking software for a smartphone application that would allow for recording the time, location, and duration of exercise completion, should include larger sample sizes, and may wish to explore more diverse populations in terms of gender, age, and level of previous voice education/training.

Conclusion

The purpose of this pilot study was to examine the impact of video modeling as a supplement to home practice within the VFE framework in the treatment of voice disorders. Four participants were enrolled in the study. Upon meeting all inclusion criteria, participants were randomly assigned to either the experimental group or the control group. Participants within the control group received only the traditional instructions to complete the VFE home practice regimen (including VFE log and audio recording of instructions). Participants within the experimental group were provided with the VFE log and audio recording, but also with a video recording of their first voice therapy session, including constructive feedback (i.e., visual cues, verbal cues, instruction, and modeling) from the treating clinician. Visual inspection of the data obtained from the study indicates that the areas of most notable benefit of using video modeling with the VFE protocol in terms of laryngeal health and function may be an increase in adduction exercise phonation times. In terms of the instructional cues required within the therapy session, the results of the current study suggest that incorporating video modeling into the patient's home practice regimen may reduce the total number of instructional cues required by the patient, the number of verbal cues required, and the total number of explicit instructional cues required across the first 3 therapy sessions. In terms of ratings of self-efficacy, the area of most notable benefit of using video modeling within the VFE framework may be the maintenance of relative importance of voice therapy to the patient across sessions. In summary, the areas of most notable benefit of video modeling may be increases in adduction exercise phonation times; decreases in instructional cues, verbal cues, and explicit instructional cues; and the maintenance of relative importance of voice therapy to the patient across sessions. The findings of the current study may be beneficial for speech-language pathologists in regard to decreasing the amount of time it takes voice therapy patients to learn to correctly implement the VFE protocol in their home practice regimen and increasing the overall efficiency of VFE when used in the treatment of voice disorders.

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Appendix A

Vocal Function Exercises Log

VOICE EXERCISE DATA SHEET

DO EACH EXERCISE AS SOFTLY AS POSSIBLE; 2 TIMES EACH; 2 TIMES/DAY; RECORD TIME FOR NOTES - CHECK BOX FOR GLIDES

EASY ONSET; FRONT FOCUS; MAXIMUM OUTPUT WITH MINIMUM EFFORT; NO BREAKS, WAVERS, OR BREATHINESS

		warm-up		stretch		control		low/stability		low/stability		transition		high/stability		high/stability	
DATE	AM / PM	MATCH NOTE ____; NASAL VOWEL 'EE'		GLIDE UP "WHOOP"; "KNOLL"; LIP VIBRATION		GLIDE DOWN "WHOOP"; "KNOLL"; LIP VIBRATION		MATCH NOTE ____; "OL" LIPS ROUND		MATCH NOTE ____; "OL" LIPS ROUND		MATCH NOTE ____; "OL" LIPS ROUND		MATCH NOTE ____; "OL" LIPS ROUND		MATCH NOTE ____; "OL" LIPS ROUND	

Appendix B

Readiness Ruler "Self-Efficacy for Voice Therapy" Likert Scale

Read each question and then write down the number that indicates your honest assessment using the scale below. Do not be afraid to use extreme values, such as "0" if you are very uncertain about achieving a goal or "10" if you are extremely positive about achieving the goal.

0 1 2 3 4 5 6 7 8 9 10

Not at all Somewhat Extremely

1. How confident are you that your voice will improve with voice therapy? _____

2. How confident are you in the therapy program you have chosen? _____

3. How confident are you that you will practice voice therapy exercises twice daily? _____

4. How committed are you to this goal? _____

5. How important is this goal compared to other things you have to accomplish this week? _____

6. How certain are you that you are capable of practicing your voice exercises twice daily given the following circumstances?

   When you are busy _______

   When you are tired _______

   When you are traveling _______

   When you don't have time alone _______

   When other people can hear you practice _______

   When people around you are unsupportive _______

Adapted from: van Leer, E. & Connor N.P. (2012), Use of portable digital media players increases patient motivation and practice in voice therapy. Journal of Voice, 26 (4), 447-453.

Appendix C

Script for Addressing Interested Participants

1. "Thank you for your interest in the study."
2. "You are interested in the study with the instruction in vocal function exercises?"
    a. "Have you been examined by a licensed, certified speech language pathologist?"
    b. "Have you been referred by a physician?"
    c. "Have you been diagnosed with a voice disorder?"
    d. "Do you have a history of participation in vocal function exercises?"
    e. "Do you smoke?"
    f. "Do you have a diagnosis of respiratory disease?"
    g. "Do you have a diagnosis of neuromuscular disease?"
    h. "Do you have a diagnosis of learning disability?"
    i. "Are you enrolled in the Miami University College of Creative Arts?"
    j. "Are you currently experiencing any problems with your voice?"
    k. "Are you at least 18 years of age?"

FOR POTENTIAL EXPERIMENTAL PARTICIPANTS:

1. If all inclusion criteria are met, then:

    "So far it looks like you qualify to participate."

    "Let's arrange a time to meet to further discuss the study and review the consent form. At that time, you can confirm your decision to participate. I will also send a copy of the consent form for you to review before your appointment. Would you prefer to receive the consent form by email, regular mail, or would you like to pick it up at the front desk of the Miami Speech and Hearing Clinic?"

    "Feel free to contact me if you have any questions about the consent form. If you choose to cancel your appointment for any reason, you may call or email us."

2. If inclusion criteria are not met for any reason, then:

    "Unfortunately, this study is not right for you because [state reason]. Thank you for your interest."

3. If the participant is excluded because of health or hearing concerns, then we will provide contact information for the appropriate health professional or the Speech and Hearing Clinic ((513) 529-2500).