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# Do Different Learning Environments Influence Graduate Students' Professional Communication?

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**in the** Department of Communication Sciences and Disorders

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# Do Different Learning Environments Influence Graduate Students' Professional Communication?


## Abstract

**Purpose:** The purpose of this study was to investigate the impact of two educational environments (jigsaw learning activity and standardized patient encounters) on speech-language pathology students' professional communication when assessing and treating a voice disorder case study. Jigsaw activities are cooperative learning experiences that provide students opportunities to learn from one another. Studies have shown that students have improvements in learning new material, self-confidence, and communication skills (Wong & Driscoll, 2008; Asif et al., 2021). A standardized patient encounter provides a real-life clinical experience for students. There has been a mixed response to students improving their communication skills through the use of standardized patients (Hill et al., 2010; Johnson & Kopp, 1996; Zraick, 2020). Both environments provided opportunities for students to practice and refine their professional communication behaviors. Our study examined whether one environment influences students' professional communication more so than the other.

**Method:** Thirty-five graduate students in Advanced Voice Disorders at West Virginia University participated in a jigsaw activity set up like medical rounds. The cohort was set up into two groups: experts and clinicians. On the first medical rounds day, groups of experts presented a voice disorder case to groups of clinicians. On the second medical rounds day, the students who were presenters on the first day became clinicians. Every student had the chance to diagnose four voice disorder cases. Later in the semester, students completed the same activity with a standardized patient in the WVU STEPS simulation lab.

**Results:** Two related-samples Wilcoxon signed-rank tests were used to evaluate the median difference in student professional behaviors during the beginning and end of medical rounds (MR1 and MR4, respectively) and MR4 and a standardized patient encounter (SPE). Significance value was adjusted for multiple tests ($p = .025$). Students increased their median percentage of professional communication behaviors from MR1 (median = 75%) to MR4 (median = 88.89%; $z = 3.686$, $p < .0005$). A significant increase in professional communication behaviors was also observed from MR4 to SPE (median = 93.67%; $z = 3.233$, $p = .001$).

**Conclusion:** The current work contributes to the scholarship of teaching and learning (SoTL) literature regarding professional communication behaviors in graduate student learning in communication sciences and disorders (CSD). In the medical SoTL literature, the type of communication behaviors learned during jigsaw activities was unclear (Asif et al., 2021; Rathore et al., 2017; Sanaie et al., 2019; Wong & Driscoll, 2008) and not examined in CSD SoTL work. The results of this study suggest CSD graduate students learn professional communication behaviors relevant to clinical practice during jigsaw learning activities. Moreover, our study results suggest there is a benefit to placing students in higher fidelity learning activities to further enhance their professional communication skills (cf. Zraik et al., 2003).

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# Introduction

Graduate student education in communication sciences and disorders (CSD) requires varied clinical experiences in and out of the classroom. Students are required to obtain skills and knowledge on a variety of diagnostic and therapeutic procedures to prepare them to work with a clinical population. While learning the knowledge is vital to treat each patient, students also have to obtain professional communication skills to have positive interactions with patients. In clinical education, there are a variety of different activities that can be utilized to ensure students are efficiently learning new material and obtaining communication skills. One way that students are learning new material is through cooperative learning activities. Cooperative learning is a strategy that must include these elements: positive interdependence, individual accountability, face-to-face promotive interactions, appropriate use of collaborative skills, and group processing (Felder & Brent, 2007). Using cooperative learning activities in education has been shown to enhance communication in professionals within healthcare settings (Smallwood, 2020). Cooperative learning, however, can take an extensive number of forms. One activity that may be especially useful in graduate student learning is a jigsaw learning activity.

Jigsaw learning activities are designed for students to develop higher-order thinking and confidence in the material they are learning (Wong & Driscoll, 2008). Jigsaw activities have also been shown to increase motivation in the classroom while increasing self-regulated learning (Asif et al., 2021). Studies also have reported improvement in communication and collaboration within clinical environments when these types of activities are used (Smallwood, 2020). These factors (higher-order thinking, confidence, motivation, and self-regulated learning) are all elements desired in graduate-level work as students learn to become more independent in their learning and less dependent on the instructor.

There are many ways to set up a jigsaw activity within a classroom setting as long as students partake in an "expert" and "learner" role. This is key to the jigsaw activity – the expert teaches the learner information by providing the last "piece to the puzzle" (so to speak). One example might include placing students into small groups and assigning different portions of the week's reading. Each group would be responsible for becoming an "expert" of their section and would then teach what they learned to the rest of their classmates (Marhamah & Mulyadi, 2013). Alternatively, you could design time in your class for learning specific topics of expertise that would then be used in a secondary activity. For example, students might be placed into small

groups to learn specialized information (i.e., to become experts) and then be placed in a second group to use that information in problem-based learning or a case study (Wong and Driscoll, 2008).

Currently, there is little to no research in the field of CSD relating directly to the use of jigsaw activities. However, there are examples from other health-related fields, like physical therapy, nursing, and pharmacy that may provide examples of how these cooperative learning activities could be used in CSD graduate education. In a study conducted by Wong & Driscoll (2008), physical therapy students designed and mastered a comprehensive plan of care for a person with complex medical needs. Thirty-six students were split into four groups, where each of the four groups were responsible for becoming an "expert" on nine content areas (a total of thirty-six content areas being learned in total by the class). Students then collaboratively solved three complex patient cases by identifying the diagnosis, prioritizing problems, and developing a comprehensive plan of care by working in varied groups (Wong & Driscoll, 2008). The jigsaw data were compared to the one week of independent study time given prior to the jigsaw activity. The results showed that content quizzes and student assessments improved after the activity, thus the jigsaw activity was shown to be more effective compared to individual study (Wong & Driscoll, 2008). Results also showed that students felt more confident in the material they were learning (Wong & Driscoll, 2008).

In a clinical study conducted by Sanaie et al. (2019), investigators compared how lecture and jigsaw activities influenced self-regulated learning and academic motivation in nursing students. The students became experts on their given material and were given 10 minutes to present that material to their classmates while working in groups (Sanaie et al., 2019). Based on a questionnaire authored by the investigator of the study, Sanaie et al. (2019) concluded that the students using the jigsaw activity had improved in self-regulated learning compared to the group receiving classroom instruction. In this study, as well as in the Wong and Driscoll (2008) study, students demonstrated increased knowledge and learning following jigsaw activities, with some data from Wong and Driscoll (2008) concluding that student learner confidence also increased. However, these studies did not evaluate other elements of this cooperative task that may also be enhanced by cooperative learning (especially when compared to lecture), such as communication.

The role of communication was evaluated in clinical study conducted by Asif et al. (2021), where the investigators evaluated the effectiveness of jigsaw activities compared to lecture in students enrolled in a clinical pharmacology course. Students were given two hours a week of instruction by lecture and one hour a week of learning by jigsaw activity (Asif et al., 2021). Students were evaluated on materials from both activities (lecture and jigsaw activity) at the same time. Results demonstrated improved scores on the material from the jigsaw activity compared to the information from the lectures (Asif et al., 2021). Using a questionnaire provided at the end of the study, Asif et al. (2021) measured and reported enhanced communication skills of students participating in jigsaw activities.

A study completed by Rathore et al. (2017), investigated specifically how communication is affected when using a jigsaw learning activity as a teaching method. Students learning new material in a physiology course were asked to divide into small groups and learn new material. Later, they were asked to return back to their home groups and present that material to their peers (Rathore et al., 2017). The evaluation measures in this study were completed by a questionnaire given by the investigators of the study, which looked directly at the feedback from the students who participated in the jigsaw learning activity. The majority of students feedback indicated they felt their communication skills were improved by acting as the presenter of information during the jigsaw activity (Rathore et al., 2017).

In summary, these few studies suggest that jigsaw activities can effectively be used in clinical education throughout many different allied health professions and in a variety of different learning contexts and activities. These results also suggest jigsaw learning activities enhance student learning, confidence, and communication especially when compared to lecture alone. What is unclear and has yet to be published or reported on in the literature, is the type of communication enhanced by these jigsaw activities in these clinical disciplines. Specifically, if the increase in communication effectiveness was generalizable to a clinical setting? Are students able to translate knowledge that may be technical and full of jargon into patient-friendly terms? Do they misread communication environments when engaging with their clients (e.g., interrupting or talking over their client)? Do students stay engaged with their client once they have shared their professional expertise? These clinical professional behaviors are required for graduate students to be successful in translating their knowledge into a clinical situation.

However, it's unclear if a jigsaw activity, where practice on skills and the communication of those skills, is enough for the above mentioned professional behaviors to emerge and generalize.

It may be that learning effective communication strategies related to the area of expertise learned during a jigsaw activity is not the same as learning how to professionally communicate in a clinical setting. If not, are there other elements required for student learning that are needed for professional communicative behavior to emerge? Does the environment that students learn in also matter? Perhaps to be able to bridge student learning in the classroom to real-life clinical experiences there needs to be a more high-fidelity approach to teaching students correct clinical behaviors in a more high-stakes environment. Simulation experiences provide a more high-fidelity experience and use of standardized patients allows for evaluation of professional communication in a standardized way (Hill et al., 2010).

A standardized patient (SP) is an individual who portrays a medical patient in a simulated experience designed to help students learn (Hill et al., 2010; R. Zraick, 2012; R. Zraick, 2020). The SP is used for students to practice instruction, assessment, or communication skills in a simulated event, where the SP is acting like a patient the student would treat in a clinical setting (R. Zraick, 2012; Hill et al., 2010). Each SP assigned to a student is asked to act in a particular way, use a certain medical background, and respond to students in set ways. Within speech-language pathology, SPs have demonstrated a high degree of accuracy in portraying the CSD scenarios requested of them to provide a high-fidelity experience for students (Hill et al., 2013). Similarly, SPs have been able to portray complex communication disorders (e.g., aphasia) accurately and convincingly (Baylor et al., 2017; Kühne et al., 2018; R. Zraick, 2020). Thus, control of the communication responses provided back to students is controlled and may provide a more "real" experience compared to working with a peer in a small group who may not be able to emulate a patient experience in the same fidelity (Hill et al., 2010, 2012).

Student learning outcomes have been reported as equivalent when comparing SP encounters to general lecture, student role play, and real patients (Hill et al., 2010). However, whether or not students' professional communication was enhanced by SP encounters is mixed. Though many studies have suggested enhanced communication (see Hill et al., 2010; Zraick, 2020 for reviews), there have been reports where there has no significant difference in communication skills regardless of SP feedback (Johnson & Kopp, 1996; Hill et al., 2010) or general encounter with an SP (Haist et al., 2003; Hill et al., 2010). Moreover, it has also been

reported there are were no difference in the development of interpersonal communication skills despite multiple encounters with SPs (Zraick et al., 2003). Thus, whether SPs provide an environment for CSD students to practice and enhance professional communication behaviors is unclear.

In summary, it remains unclear what the role jigsaw learning has on professional communication behaviors in CSD graduate student learning. Moreover, when contrasted with more high-fidelity SP encounters, it is unknown whether CSD students' professional communication skills would change (or even be enhanced). In our study, we evaluated the effects of two different environments (jigsaw learning activity and standardized patient encounter) on CSD graduate student professional communication. We looked at two environments. The first environment was a low-fidelity simulation, meaning there are limited requirements for practicing skills (Massoth et al., 2019). The second environment used a high-fidelity simulation, which gave students an immersive and realistic environment (Massoth et al., 2019). By comparing the two environments, we were able to look closely at how students were communicating in each environment. We assumed the jigsaw learning environment would help students gain knowledge, skills, and confidence on a voice assessment task but may not enhance their professional communication behaviors. We also hypothesized students would demonstrate increased professional communication skills with the standardized patient compared to the jigsaw learning activity.

# Methods

## Subjects

Thirty-five students enrolled in CSAD 622: Advanced Voice Disorders at West Virginia University (WVU) participated in this study. All graduate students enrolled were in their second year of their M.S. in Speech-Language Pathology. All students had experience with jigsaw activities with the co-investigator, as well as experience working with standardized patients in previous courses. This project was reviewed by the WVU STEPS institutional review board, and all students provided consent to participate.

## Design

This study was a within-subject design looking at the two environments with differing simulation fidelity (jigsaw learning activity and standardized patient encounter) and how those two environments influenced changes in professional communication. Professional communication was evaluated using a behavior checklist constructed by the authors.

## Overview of the Activity

This study is a part of a larger study examining student learning outcomes using jigsaw activities. This study focuses exclusively on student's ability to learn professional communication behaviors during the jigsaw activity and a standardized patient encounter.

All students were divided into two large groups (A and B), that were further divided into four groups each for Group A and B (A1, A2, A3, A4, B1, B2, B3, B4). Group A and Group B served two roles during the jigsaw activity. The first role was an expert, and the second role was a clinician. Due to the nature of the content, the jigsaw activity was described as a medical rounds activity (this nomenclature will now be used throughout the document to describe the jigsaw activity). During the medical rounds activity, Group A (subgroups A1-A4) presented a voice disorder case history as "experts" of the topic, while Group B (subgroups B1-B4) solved the voice disorder cases as clinicians by assessing, diagnosing, and treating the voice disorder through peer role play. Thus, each of the clinician groups (subgroups B1-B4 in this example) were given four chances to solve four different cases studies presented by the experts by rotating groups throughout the activity. Then on a separate day, the roles of each main group (A and B) were swapped, such that students who were once experts, were able to participate in the role of the clinician (See Figure 1). Later in the semester, the same voice assessment and treatment procedures were completed for their final exam with a standardized patient in the WVU STEPS lab.

## Procedure 1: Case Building/Pretest/Pre-confidence survey (10/28/2021)

During the class period, all groups (regardless of being in Group A or B) created their case study. The entire class time was set aside to create a PowerPoint with one slide that included the necessary case history information needed for a voice evaluation that would be used during the medical rounds activity.

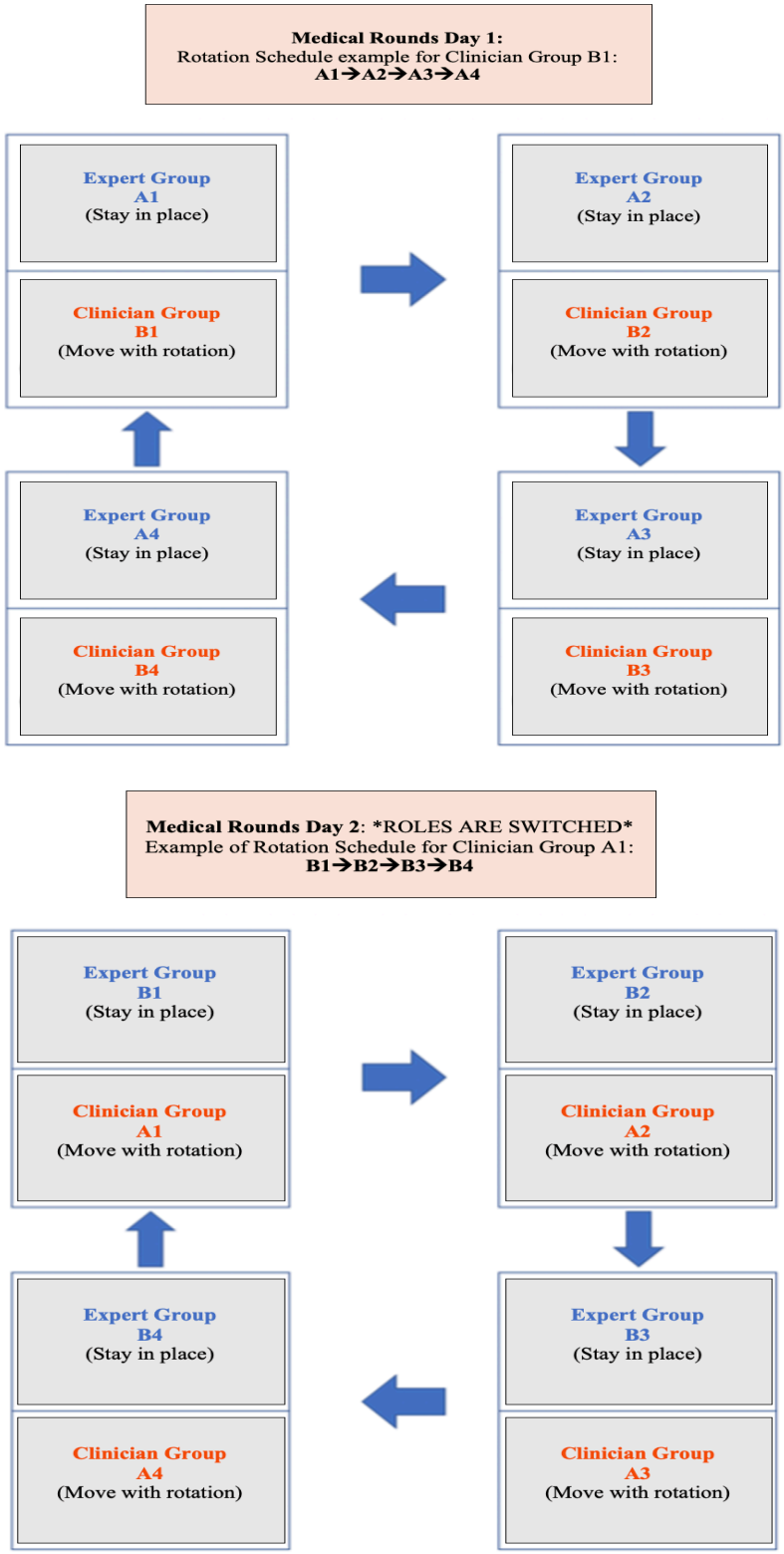


*Figure 1: Example Clinician Rotation Schedules for Medical Rounds Activity*

The information created by each group included a description of the patient (e.g., age, primary medical diagnosis), background information (e.g., any significant medical history), primary reason for referral to SLP, clinical observations, assessment/measurements and results e.g., ENT report), general goals for intervention (not provided on the PowerPoint slide), and prognosis (not provided on the PowerPoint slide).

The voice disorder cases all included a diagnosis of muscle tension dysphonia (MTD) but varied in their etiology for this diagnosis (e.g., vocal polyps, neurological disorder; Figure 2). The eight student case studies (i.e., PowerPoints) can be found in Appendix A.

| **Medical Round Day 1:** | **Diagnosis:** |
|---|---|
| Expert Group A1 | Vocal polyp with secondary MTD |
| Expert Group A2 | Primary MTD |
| Expert Group A3 | Vocal nodules with secondary MTD |
| Expert Group A4 | Neurological disorder with secondary MTD |
| **Medical Rounds Day 2:** | **Diagnosis:** |
| Expert Group B1 | Primary MTD |
| Expert Group B2 | Neurological disorder with secondary MTD |
| Expert Group B3 | Vocal polyp with secondary MTD |
| Expert Group B4 | Vocal nodules with secondary MTD |

*Figure 2: Case Study Assignments for Students*

Towards the end of this class period, students were asked to complete a pretest that consisted of multiple-choice questions regarding information that had been utilized in the creation of the case studies, as well as the information that would be needed when solving the case studies during the medical rounds activity. The questions presented for the pretest and posttest were created by the instructor and were set up in the same way as the information would be presented in the medical rounds activity. Students were given a case history, aerodynamic/acoustic measures, and a set of questions regarding the assessment, diagnosis, and treatment of the patient from the case study. The questions being asked during this assessment were meant to target the larger areas of assessment during of the medical rounds activity (e.g., diagnosis, treatment plan). This assessment was used to demonstrate if students acquired knowledge of voice diagnostics and treatment targeted during the medical rounds activity. Ultimately, the pretest and posttest was meant to serve as an assessment of knowledge generalization (Pre-test can be found in Appendix B).

Another assessment given on this day was a pre-confidence survey to test the student's confidence in assessing, diagnosing, and treating voice disorders. This assessment was given to test the student's confidence before and after the medical rounds activity, specifically looking to see if confidence changed before and after the activity was completed. Nine out of ten questions were responded to on a confidence scale of 1-10, while the last question was an open-ended question to gain perspective on the student's confidence. Students were asked to take this survey again after completing the medical rounds activity. The list of the questions asked can be found in Figure 3.

| Rate how confident you are in your ability to successfully accomplish each of the clinical tasks. Rate your degree of confidence by recording a number from 1 (no confidence at all) to 10 (completely confident).<br><br>**1= No confidence at all, 5= Somewhat confident, 10= Completely confident** |
|---|
| 1. I can select appropriate standardized instrument(s) to evaluate a client. |
| 2. I can administer the appropriate evaluation procedure to the client. |
| 3. I can interpret information to develop a diagnosis. |
| 4. I can integrate information from courses to develop a diagnosis. |
| 5. I can develop functional goals for client. |
| 6. I can determine appropriate cues for client. |
| 7. I can measure the performance of the client. |
| 8. I can communicate effectively with my client. |
| 9. Rate your overall confidence in assessing, diagnosing, and treating your client/s on a scale of 1-10 (1=no confidence at all, 10=completely confident). Please include a 2-4 sentence explanation. (Open-ended question) |

*Figure 3: Confidence Survey*

## Procedure 2: Medical Rounds Day 1 (MRD1) on 11/04/21

During Medical Rounds Day 1 (MRD1), the expert groups (A1-A4) were set up at four different tables around the room. They came to class prepared with their case history PowerPoint pulled up on their laptop so that the clinicians could easily view it during the activity. For this activity, the students who were the experts on that day had to participate in peer role playing. In a regular voice assessment done by a speech-language pathologist (SLP), the SLP needs to obtain a voice sample to assess the loudness, pitch, and quality of the patient's voice as part of the assessment process. When each clinician group (subgroups B1-B4) were stationed at an expert groups table, they had to pair up (one clinician with one expert) so the activity could be successfully completed in a role-playing scenario.

The first step of the activity was the clinician looking over the case history produced by the expert. The clinician was able to ask any additional questions if something was not provided

on the PowerPoint slide. Next, the clinician had to obtain a voice sample from the student expert using a speech analysis technology software, Pratt. Prato is a software that "provides a comprehensive toolbox for use in analyzing and synthesizing sounds" (Owren, 2008, p. 822). By using Praat, the clinicians were able to assess the loudness, pitch, and quality of the experts voice, just as they would in a clinical setting. The experts were instructed by the co-investigator to produce a breathy and strained voice when giving their clinician the voice sample. They were instructed to do this so the data pulled from Praat would be similar to the data of a person with poor voice abilities. During the Praat assessment, the expert was instructed to produce three sustained vowels, three sustained pitch glides, and a fifteen second sample of a passage being read (Patel et al., 2018)

The next step of the activity was completion of the Patel el al. (2018) Voice Assessment sheet. Once the expert was done giving their voice sample, the clinician filled out the assessment sheet on their computer. The sheet asked questions about the loudness, pitch, and quality of each part of the voice assessment. It also asked questions about the etiology of the voice disorder, the diagnosis for behavioral treatment, the rationales based on acoustics, the general treatment approach, and the specific short term goals (including cues) given by the clinician. The part of the activity took up the majority of each round because of the depth of the questions. This form is located in Appendix C.

Finally, the last step of the round was treatment. By reviewing the assessment and data analysis (diagnosis), the clinician determined the treatment that should be completed with the expert. This treatment included the use of appropriate cues during the treatment, as well as using easy to understand language to describe the treatment to the expert.

Once the first round was done, the clinicians rotated to the next expert group and started on their second voice disorder case. There were four rotations in total, i.e., four voice disorder cases to be solved. Time limits were set up during the medical rounds activity to encourage students to be more efficient in their voice diagnostic abilities. The first round lasted 40 minutes, the second and third round lasted 35 minutes, and the last round lasted 30 minutes. Rounds one through three during the medical rounds activity were for practice only. Students were graded during the fourth and final round for the class assignment. All rounds, regardless of grading, were recorded on each student's laptop and uploaded to a Google Drive folder provided by the co-investigator.

Each student who was acting as a clinician had to record themselves on their laptop for the entire duration of each round. Most students used Zoom or another related system to record themselves. Throughout the activity, there were noted recording issues from a few of the students, which will be described later in the Data Analysis section. When issues arose, the instructor helps troubleshoot with the student.

### Procedure 3: Medical Rounds Day 2 (MRD2) (11/11/2021)

The same procedure was conducted on Medical Rounds Day 2 (MRD2), except whoever was a clinician on MRD1, switched roles and become an expert for MRD2. Further, groups B1-B4 became the expert groups and groups A1-A4 became the clinicians (see Figure 1). After MRD2 was complete, students were asked to complete the post-confidence survey, which asked the exact same questions as the pre-confidence survey. Additionally, they were asked to complete a post-test to assess their knowledge following the activity. Like the pre-test, this was a case study problem involving a similar voice client with MTD that students were required to answer multiple-choice questions (see Appendix D).

### Procedure 4: Final Exam with SP (12/13/2021)

The last procedure in this study was the students' final exam during a standardized patient encounter (SPE). The students completed this simulated experience in the WVU Simulation Training and Education for Patient Safety (STEPS) lab. The procedure setup was the same as when the student completed the medical rounds activity (e.g., Praat assessment, data analysis, diagnosis, and treatment). Instead of the students participating in peer role play, the students had to solve a voice disorder case with a standardized patient (SP). In this example, the SP acted as the expert of the learning environment. After the encounter, each SP filled out a questionnaire about the quality of care by the students (Questionnaire can be found in Appendix E).

Before the final exam, the co-investigator created four case histories from ENT reports that the SPs used as a template for the voice patient role. The SPs were trained prior to the exam on how to produce a breathy and strained voice without harming themselves. The actors were individuals recruited from the community with interest in helping students become efficient professionals once they finish their degree. Most actors had been a part of the SP program in the WVU STEPS lab for many years and had experience playing the roles.

The layout of the STEPS facility included twelve rooms with an SP in each of the rooms at all times. The students were assigned a certain time to go to their designated SP room, with twelve students completing the SPE at a time. Figure 4 shows the layout of the WVU STEPS lab.

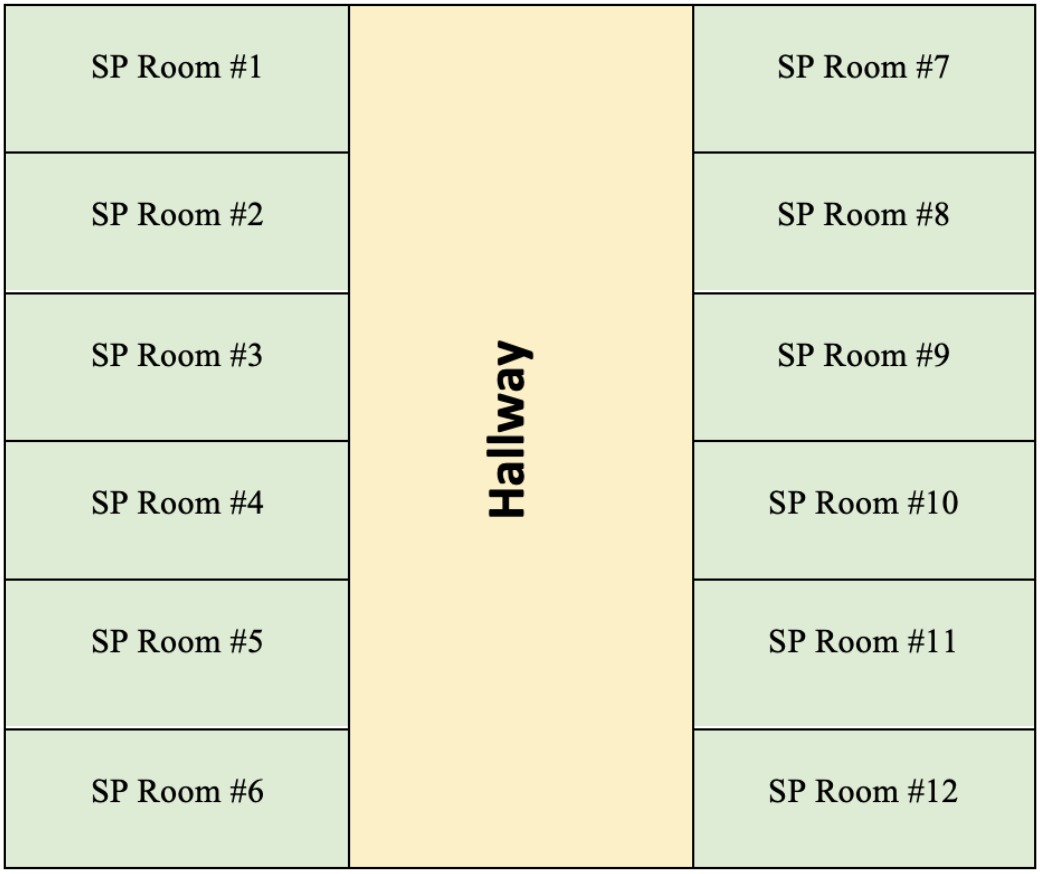


*Figure 4: STEPS Lab Layout*

In each room, there was a stool, a chair, an examination table, and a sink for hand washing. The SP decided if they wanted to sit on the examination table or on the chair. The room was meant to feel and look like a regular medical examination room found in clinics and hospitals, giving the students a more real-life experience. In the room, two cameras were used to record the interactions between the students and the SP. Later when observing the interactions for grading and research purposes, all videos were uploaded onto a website called CAE Learning Space Enterprise. Students and instructors were able to access these videos for learning, grading, and research purposes.

## Behavioral Checklist for Professional Communication

To look further at student's professional communication, a behavior checklist was created to check off certain behaviors demonstrated by the students in both environments. These behaviors were deemed necessary and appropriate for client interactions. More specifically, the checklist was designed to evaluate students' interactions during the SPE and to determine whether the communication used during these interactions was professional. The questions we asked during these interactions can be found in Figure 5.

| **Behavior Checklist for Professional Communication** | |
|---|---|
| **Question 1** | Did the clinician describe what was going on? |
| **Question 2** | Did the clinician use appropriate listening and turn-taking skills? |
| **Question 3** | Did the clinician engage with the client throughout the time period? |

*Figure 5: Behavior Checklist Questions*

Professional communication characteristics were determined from research by R. I. Zraick et al. (2003) and Shield et al. (2011). R. I. Zraick et al. (2003) evaluated interpersonal and communication skills of students in CSD working with standardized patients. Their six behavior checklist was condensed to create Question #1. Question #2 was derived from Shield et al. (2011), which evaluated medical student's professional communication. For Question #3, the question was specifically designed for our study. Since the majority of the therapy session in the medical rounds activity and the standardized patient encounter consisted of data analysis, i.e., requiring minimal communication with the patient, we asked Question #3 to see if the clinician stayed engaged throughout the therapy session.

For each of the questions being asked on the behavior checklist, there are certain criteria for each question to consider if each student was performing the behavior or not. The criterion for each question is listed in Figure 6.

| Behavior Checklist for Professional Communication | | Criteria/ Questions to Ask During Interaction |
|---|---|---|
| **Question 1** | Did the clinician describe what was going on? | • Did the clinician describe how they were going to conduct the assessment/ diagnosis/ treatment before they started each part? |
| **Question 2** | Did the clinician use appropriate listening and turn-taking skills? | • Did the clinician interrupt the client at any point?<br>• Did the clinician wait for the patient to finish speaking before talking?<br>• Did the clinician seem to be listening to the patient throughout the session? |
| **Question 3** | Did the clinician engage with the client throughout the time period? | • Was there back and forth conversation between the clinician and patient?<br>• Was there a long period of silence during any part of the therapy session? |

*Figure 6: Behavior Checklist Criteria*

## Data Analysis

Although there were multiple dependent variables assessed during this study (e.g., confidence surveys, pre-post test data), only the behavioral checklist data was utilized to address the present study's questions.

Four students enrolled in CSAD: 497, an undergraduate elective research course, helped analyze the data from the videos provided for medical rounds and the standardized patient interactions. Video assignments were randomized across each of the student raters, as well as the different activities (medical rounds or SPE). Students were asked to use the checklist of behaviors to answer Questions 1-3 for each environment: medical rounds 1 and 4 (MR1 and MR4, respectively) and SPE. To aid students in their ratings, different time margins within the entire therapy session were created. Each video was sectioned into four different time points (Figure 7). By doing this, each person conducting the behavior checklist for each subject had to answer the three questions for each of the four sections. Thus, each lab assistant rated a given subject on twelve questions related to professional communication. Reliability checks were

completed using pseudorandom assignment, such that raters were not allowed to re-review the same subject a second time.

| Time Point | Criteria |
|---|---|
| **Greeting** | **Start:** As soon as the student says type of greeting<br>**Stop:** the clinician asks patient to start the assessment process. |
| **Assessment** | **Start:** When the instruction for the assessment starts<br>**Stop:** The patient completes reading the passage within the assessment. |
| **Analysis** | **Start:** When the passage is completely read<br>**Stop:** Clinician is finished with data analysis on computer. |
| **Treatment** | **Start:** When student completes data analysis on computer<br>**Stop:** Clinician and patient stop discussing voice therapy. |

*Figure 7: Time Point Criteria*

## Statistical Analysis

Data from five students were removed due to recording error resulting in fewer than 67% of video data being available for analysis. This was mostly due to recording issues during medical rounds when students were using their own personal laptops to record their sessions. Specifically, videos were not available due to student's laptops not staying charged throughout the activity and shutting down, not enough storage to save a video file, and spontaneous computer shutdowns.

## Results

Two related-samples Wilcoxon signed-rank tests were used to evaluate the median difference in student professional behaviors during 1) MR1 vs MR4 and 2) MR4 and SPE. Significance value was adjusted for multiple tests (p = .025). Results showed that students increased their median percentage of professional communication behaviors from MR1 (median = 75%) to MR4 (median = 88.89%; $z = 3.686$, $p < .0005$). A significant median increase in

professional communication behaviors was also observed from MR4 to SPE (median = 93.67%; $z = 3.233$, $p = .001$). Figure 8 depicts these results.

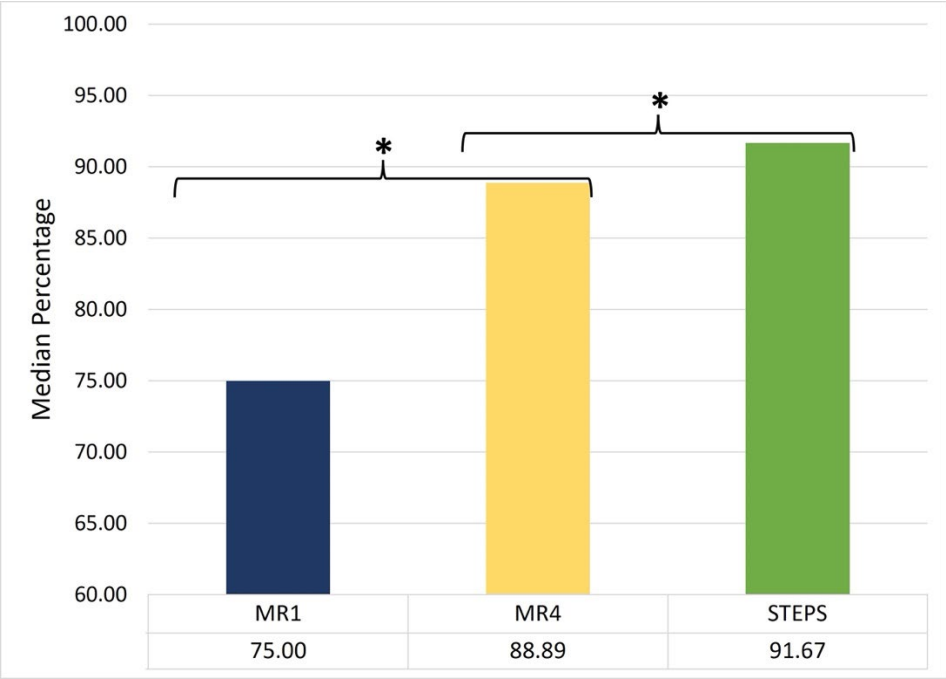


*Figure 8: Results Bar Chart*

## Discussion

Our study looked specifically at student's professional communication behaviors in two educational environments (jigsaw learning activity and standardized patient encounter). We asked two main questions in this study. The first question: were professional communication behaviors learned during the jigsaw activity? The second question: were more professional communication behaviors used in a high-fidelity environment, such as a SPE? We hypothesized that students would increase their professional communication behaviors from MR1 to MR4, and we also hypothesized that there would be an increase in professional communication behaviors during the SPE compared to the last round of the jigsaw activity (MR4).

Our results suggest that students' professional communication behaviors improved from MR1 to MR4, confirming our first hypothesis. There was a 13.89% increase in professional communication behaviors from MR1 to MR4. This data suggests the jigsaw activity helped students learn those behaviors as they went through the activity. This is encouraging as

professional communication behaviors were not directly targeted during this activity; thus, students must have learned the professional communication behaviors indirectly. Our results are different compared to Asif et al. (2021) and Rathore et al. (2017), as they looked more broadly at the communication skills being shown by students. We specifically evaluated professional communication skills important for graduate students in CSD with an explicit behavior checklist. This checklist had criteria that laid out professional communication behaviors during their interactions in both educational environments. When looking at other studies assessing professional communication behaviors (Asif et al. 2021; Rathore et al. 2017), researchers did not have specific criteria when assessing their students communication skills during those studies. Moreover, assessments of behaviors were by a questionnaire, rather than directly observing behaviors.

In SPEs, students are put into a situation very similar to a real-life clinical setting, which we hypothesized would increase students' professional communication behaviors compared to a classroom setting (MR4 vs SPE). Our results confirmed this hypothesis with an increase of 2.78% professional communication behaviors observed during the SPE compared to MR4. Overall student mastery of the clinical activities should have been the same in these two environments as students were not required to complete any additional learning tasks in the timeframe between the two activities. Therefore, we attribute our results to the fidelity of the environment. Our results are in contradiction to a study from R. I. Zraick et al. (2003), where students' interpersonal communication did not show improvement when working with a SP. Further, students had to be explicitly taught interpersonal communication skills later in the study to demonstrate improvement (R. I. Zraick et al., 2003). It could be that the jigsaw activity provided to our cohort of students provided the indirect learning of professional communication skills that was not present in Zraick et al. (2003). However, as noted previously, the fidelity of the simulation experience further enhanced these experiences. Zraick et al.'s (2003) description and inventory of interpersonal communication skills, as well as their measurement, also varied from our design and may explain some of the differences between our two studies.

There were a few limitations in our study. Our results are limited to a single cohort of students. In future studies, sample sizes should include larger cohorts, including additional cohorts from a variety of programs to generalize the findings. Secondly, we were limited in our technology for recording the medical rounds. During MRD1 and MRD2, students had computer

malfunctions which resulted in removal of data from the analysis. For future studies, a better approach to video recording for medical rounds would be the use of computers or iPads provided by the investigator that could be controlled for power supply, recording storage, and overall ability to record. Finally, there was a possible order effect in our data collection during medical rounds. An order effect may occur by the order of which the students complete the activities in this study. Since we could not randomize the three main data points (MR1, MR4, and SPE) due to the nature of this study, this is a possible limitation. Ways to avoid this in the future would be to randomize the environment order and to have a larger sample size.

In the future, it would be interesting to evaluate the effect direction instruction would have on students' professional communication behaviors. In our study, students were not directly taught professional communication behaviors in the two environments. Wong & Driscoll (2008) demonstrated that teaching communication behaviors resulted in better proficiency in using communication. This suggests that direct instruction may contribute to an even greater acquisition of communication behaviors or a faster acquisition of behaviors across activities. Similarly, we questioned whether direct instruction is needed if you a well-defined communication behavior checklist is used. A different avenue of investigation may include the erratic behavior of the communication partner that is interacting with the student. If the SP or peer was trained to act erratic or difficult with their clinician, would students still maintain the professional communication behaviors seen in our study? Would there need to be additional direct instruction to prepare students for these types of individuals? These questions and future research studies will provide further insight into how CSD graduate students acquire professional communication behaviors during their graduate school training.

In conclusion, this study evaluated CSD graduate students' professional communication behaviors in two environments: a jigsaw activity (MR1, MR4) and SPE. Students were trained to diagnose and treat patients with muscle tension dysphonia during a medical rounds activity, where they solved four voice case studies. During their final exam, they completed the same activities with a SP during a clinical simulation (SPE). Despite no direct or formal instruction on professional communication, students' professional communication behaviors increased from MR1 to MR4, as well as from MR4 to SPE. This study demonstrated that jigsaw activities indirectly increases student's professional communication. Additionally, with higher fidelity environments (e.g., SPEs) more professional behaviors are indirectly acquired.

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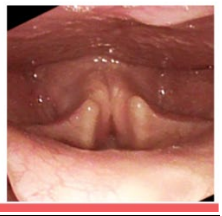
# Appendix A: Case Histories Created by Students

## Travis

- 35-year old male
- Gym teacher at Greenbrier East High School and head football coach
- Complaints of a hoarse breathy voice and feels his pitch is higher than it used to be
  - Has vocal fatigue resulting in voice loss nearing the end of football practice
  - Reports his voice is much better in the morning than in the evening
- Reports feeling of tension in his neck region
  - Limited ROM of neck muscles (sternocleidomastoid)
- Visual observations included tense shoulders, neck and jaw
- Endoscopy revealed that there is no pathology of the vocal folds
  - Noted ventricular fold adduction during production of a sustained vowel
- Maximum phonation time was 9 seconds
- Reduced flow rate



## Case Background

Kristin is a 23-year old singer who has a gravely, harsh sounding voice. She has been singing since she was 4 years old and is going to college for music education and speech-language pathology. She recently visited an ENT office after performing during a concert and her voice "gave out" mid-performance. The ENT performed an endoscopic evaluation and saw burst blood vessels anteriorly with bilateral nodules.. Kristin was recommended to see you for voice therapy as she wants to continue singing healthfully and "cure" her nodes.

## Case History: Rhonda MacDonald

**History of the Problem**
Rhonda MacDonald, a 48-year-old female, was referred to our office by her otolaryngologist with complaints of a raspy, breathy voice. Videoendoscopy revealed a unilateral polyp on the right vocal fold.

**Medical History**
MacDonald presented with a prior medical history consisting of chronic allergies, persistent cough, and frequent upper respiratory infections. The patient reported no pertinent procedures, diagnoses, or medications.
MacDonald reports that she has smoked one pack of cigarettes a day for the last 20 years and uses alcohol in social settings on the weekend. She reports consuming one cup of coffee every morning and drinks 2-3 cups of water a day.

**Social History**
MacDonald has been married to her husband for twenty-one years and she has two stepchildren M-24, M-27. MacDonald enjoys playing Bingo on the weekends with her friend Wendi.

**Signs/Symptoms:** During the evaluation, persistent throat clearing and cough were noted. Patient reports throat tightness, neck tenderness, vocal fatigue. She notes that she has the most trouble with her voice after work, playing Bingo, and after strenuous disagreements with her husband.

# Preston

**Background Information/Clinical Observations:**

Preston is a 35-year old male who works at Morgantown High School as a history teacher and coaches the football team. He was referred by his ENT after being diagnosed with bilateral vocal fold polyps with complaints of poor vocal quality and vocal fatigue, which he reports to worsen throughout the day, especially after a practice or game.

Preston presented with a hoarse, breathy vocal quality and soft, reduced loudness. Speaking behaviors were characterized by a moderate-to-severe degree of neck tension.

A rigid endoscope was introduced transorally, and we studied the vocal fold activity by videostroboscopy. Anatomically, the larynx and surrounding structures, including the cricopharyngeal inlet and pyriform sinuses bilaterally, appeared normal. The bilateral polyps on the vocal folds were also observed, and appeared to be reddish in color. During phonation, complete closure of glottis was not observed due to polyp obstruction and the false VF bilaterally would creep to midline. Phonation times were brief, suggesting poor valving of subglottal air.

## Valerie Felicity Frizzle — Age: 44

**Referral:** Primary Care Physician
**Occupation**: 4th grade teacher at Walkerville Elementary
**Medical History:** Smokes ½ pack of cigarettes a day; Diagnosed with hypertension at 35 years old and is currently on amlodipine for treatment
**Client Concerns:** My students cannot hear me, my neck and throat are tight after I talk for a short time, especially when I yell at my students to be quiet. I find myself exhausted easily.
**Clinician Observations:** perilaryngeal tension, clavicular breathing, hoarse strained-strangled voice quality, reduced maximum phonation time, and short breath phrases.
**OFSME:** Unremarkable, no weakness and typical ROM
**Laryngoscopy:** edema and redness of the VF, visible tension of the ventricular folds, thick mucus, hyperadduction of the VF

## Marvin 8;0

- Mom reports that he is a troublemaker; she can commonly hear him from the other side of the house
- Middle child of 6 siblings and tends to speak over them to be heard
- Voice sounds hoarse/raspy and breathy
- Reports that it hurts to speak for long periods of time and he often gets fatigued
- Marvin continues to use his voice despite the pain
- He feels as if his voice "gives up" (frequently breaks during conversation) and that his throat is "too tight" when he is trying to yell
- Endoscopic evaluation by ENT indicated bilateral lesions on the anterior portion of the vocal folds and hyperfunctioning of the arytenoids
- Vocal chords appear rough and red; unable to fully adduct during vocalization

## Case History

Beatrice is a 56 year old female who actively participates in a choir 5 days per week.

She reports that she has difficulty communicating backstage and states: "I feel like people can't understand what I say and I feel like my words get cut off." She also stated that she often shouts for people to understand her. However, her singing is not impacted.

Clinician informally noted that the client's pitch was increased. Aphonic breaks were also noted during conversation.

## Aerodynamics

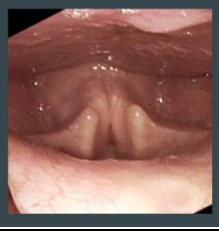
**Flow** - 80 ml/s

**Pressure via Manometer** - 15 cmH20

**Maximum Phonation Time** - 7 sec.

## Nasoendoscopy

Notable spasms in the pharyngeal cavity noted during phonation.



GROUP 6: Busra Ensar, Erica Gorman, Carolyn Helenski, Danielle Pretre

# ERIC - 62 Y/O - MALE

**Primary diagnosis: Myasthenia Gravis**

- No other relevant past medical history or surgeries
- Respiration measures
  - Flow: variable
  - Pressure: variable
  - Breath phrase: the longer he talks, the shorter it becomes
- Stroboscopy results:
  - Compressed muscles
  - False vocal fold movement
  - Weakness
  - Asymmetrical and overuse of adenoids
- Eric reports when it is difficult for listeners to understand him, he "pushes even harder" to try to improve his voice
- After his MG diagnosis, Eric's wife of 40 years filed for a divorce. He is struggling to process both his diagnosis and the loss of the love of his life

# Appendix B: Pretest

**Pretest**

Matthew is a 4-year-old boy with an unremarkable developmental history. Matthew's mother reports an unremarkable pregnancy with natural birth at 40 weeks. She also reports that Matthew met all his fine and gross motor milestones at developmentally appropriate ages. His speech and language milestones were developmentally appropriate with his first word at 11 months of age and two words by 23 months. Recently Matthew has become hoarse and has two bouts of laryngitis in the past three weeks. While ill, Matthew's volume has significantly decreased and at times he presents with aphonia (or the absence of voicing). Matthew's parents report that he is rambunctious and very loud when he speaks, and his daycare provider also states that he likes to "shout and yell all the time." Matthew's OFSME revealed ROM and strength for all articulators to be within normal limits. His resonance was appropriate respiratory support is intact with typical breath phrase length at 4-6 words. Matthew's pediatrician referred him to an ENT, and nasendoscopy revealed two bilateral lesions anteriorly.

| Aerodynamic/Acoustic Measures for prolonged /a/ | |
|---|---|
| **Measures** | **Results** |
| Subglottal Air Pressure (at medium volume) | 10.18 cm H2O |
| Airflow rate | 130 mL/s |
| Mean glottal resistance | 78 cm H2O/L/s |
| Maximum phonation time | 9 seconds |
| Average fundamental frequency | 245 Hz |
| Frequency range during speech | 141-376 Hz |

**What is the etiology of the voice disorder?**

a. right vocal fold polyp
b. vocal nodules
c. right vocal fold paralysis
d. paradoxical vocal fold motion disorder

**What is your diagnosis for behavioral treatment?**

a. primary muscle tension dysphonia
b. secondary muscle tension dysphonia
c. mutational dysphonia
d. presbyphonia

**Based on only aerodynamic and acoustic measures, what is your rationale based on?**

a. Subglottal pressure is too high for task demands.
b. Airflow and glottal resistance measures are too low for the patient's age.
c. Pitch is outside the range of normal for this individual's age and sex.

**Treatment Approach:**

a. Breath support and increase pitch
b. Rescue breathing
c. Breath support and adduction exercises
d. Breath support, semi-occluded exercises, and resonant voice exercises

**STG:**

**By November 25, 2021, Matthew will:**

a. Will use an age-appropriate pitch range while saying functional phrases used at home within one verbal cue.
b. Using relaxed throat breathing prior to circle time, Matthew will rate whether his voice feels "tight" on a likert scale (where 1-2 equals "little to no" laryngeal tension or tightness).
c. Use diaphragmatic breathing while safely adducting the vocal folds in 5/6 attempts.
d. Point to the face to denote resonant sensation on every trial of the Hong Kong Humming exercise program.

**Cues:**

**The following cues will be used for the above short-term goal:**

a. Verbal ("make your voice go high"), visual (biofeedback with voice app), tactile ("feel your stomach to help make your breath come out and your voice go high")
b. Reminder of control ("you are in control of your breathing"), tactile ("place your finger under your nose or in front of your mouth to feel the air"), stopping the activity and deep breaths
c. Verbal ("try that again"), kinesthetic ("feel the vocal folds tighten"), tactile ("push on the table")
d. Verbal for sensation ("did you feel sensation"), request for tactile ("feel your face/nose"), request for increased breath support ("remember to use your diaphragm")

# Appendix C: Patel et al. (2018) Voice Assessment

| **Patel et al., 2018 Voice Assessment** | *Norms: 65-70 dB SPL* | | *Norms age 18-60 all tasks:* *Males: 105-130 Hz* *Androgynous: 145 - 180* *Females: 186 – 225 Hz* | | | *PRAAT Norms for Adults:* *Prolonged Vowel /a/:* *≥ 14.45 dB* *Rainbow Passage:* *≥ 9.33 dB* |
|---|---|---|---|---|---|---|
| | **Loudness (dB SPL)** | | **Pitch (F0)** | | | **Quality (dB SPL)** |
| | **M** | **Range** | **M** | **SD** | **Range** | |
| Sustained vowel (3-5s) – trial 1 | | | | | | |
| Sustained vowel (3-5s) – trial 2 | | | | | | |
| Sustained vowel (3-5s) – trial 3 | | | | | | |
| Vocal glide at (2s at both ends) – trial 1 | | | | | | |
| Vocal glide at (2s at both ends) – trial 2 | | | | | | |
| Vocal glide at (2s at both ends) – trial 3 | | | | | | |
| Reading Passage (5s) – trial 1 | | | | | | |
| Reading Passage (5s) – trial 2 | | | | | | |
| Reading Passage (5s) – trial 3 | | | | | | |

**What is the etiology of the voice disorder?**

**What is the diagnosis for behavioral treatment?**

**If you can base your diagnosis on acoustics, what is your rationale based on?**

**Loudness:**

**Pitch:**

**Quality:**

**What is your general treatment approach?**

**Provide a specific STG:**

**Detail your cues:**

# Appendix D: Post-Test

**Post-test**

Mark is a 75-year-old male with a history of heart disease. Four weeks ago, he underwent triple bypass surgery to provide better blood supply to his heart. Currently Mark is presenting with breathy, hoarse vocal quality and some signs and symptoms of aspiration (including weak cough). His OFSME reveals normal movement of the upper face, jaw, tongue, and lips. Mark is able to rotate his head to the right side but presents with weakness with resistance. Shoulder elevation on the right side is also minimal with weakness during resistance. Mark is able to prolong a vowel for 20 seconds, but his voice sounds breathy and hoarse with decreased volume. Velar movement is decreased on the right side during all movements. Mark reports that he has continued being active in his church activities, including bingo and working in the community center with the children's choir. During these activities, he states he really has to "work hard" to produce voice and finds himself straining to be heard.

| Perceptual Measures | Perceptual Quality |
|---|---|
| Pitch | Masculine |
| Vocal quality | Rough, breathy |
| Loudness | Reduced, soft |

| Acoustic Measures | Pretherapy |
|---|---|
| F0 (Hz) | 115 |
| Jitter | 2.8% |
| Shimmer | 2.85% |
| CPP (dB) | 9.4 |
| Phonation time | 4 seconds |

**What is the etiology of the voice disorder?**

a. right vocal fold polyp
b. vocal nodules
c. right vocal fold paralysis
d. paradoxical vocal fold motion disorder

**What is your diagnosis for behavioral treatment?**

a. primary muscle tension dysphonia
b. secondary muscle tension dysphonia
c. mutational dysphonia
d. presbyphonia

**Based on only on perceptual and acoustic measures, what is your rationale based on?**

a. Quality measures are too variable.
b. Overall loudness and breath support are diminished.
c. Pitch is outside the range of normal for this individual's age and sex.

**What behavioral treatment approach should you use?**

a. Breath support and adduction exercises
b. Breath support, semi-occluded exercises, and resonant voice exercises
c. Rescue breathing
d. Breath support and hiding vocal tremor

**STG:**

**By November 25, 2021, Mark will:**

a. Use diaphragmatic breathing while safely adducting the vocal folds in 5/6 attempts.
b. Produce five "br" words in succession with no more than two cues provided by the clinician.
c. Use four-by-four breaths prior to bingo practice and rate laryngeal tension as a 1-2 on a likert scale (where 1-2 equals "little to no" laryngeal tension).
d. Produce five h+vowel words with shortened vowels (less than 5msec).

**Cues:**

**The following cues will be used for the above short-term goal:**

a. Verbal ("try that again"), kinesthetic ("feel the vocal folds tighten"), tactile ("push on the table")
b. Verbal for sensation ("did you feel sensation"), request for tactile ("feel your face/nose"), request for increased breath support ("remember to use your diaphragm")
c. Reminder of control ("you are in control of your breathing"), verbal counting for the client, stopping the activity and deep breaths
d. Verbal reminder to "stop" the vowel, tactile cue to tap the belly to stop the vowel (tap = stopping the breath), tactile cue to tap the belly simultaneous with clinician

# Appendix E: Client Satisfaction Questionnaire

**Client Satisfaction Survey**

The following questions are about how you feel about your experience working with our students.

Please Read Each Question CAREFULLY.

How strongly do you AGREE or DISAGREE with each of the following statements?

Provide your rating by drawing a CHECK in the box next to each question.

**Rating of 1:** I strongly agree with the statement.
**Rating of 2:** I agree with the statement
**Rating of 3:** I am uncertain of my rating.
**Rating of 4:** I am neutral on my opinion.
**Rating of 5:** I disagree with the statement.
**Rating of 6:** I strongly disagree with the statement.

| | Strongly Agree | Agree | Uncertain | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|---|
| **Questions** | **1** | **2** | **3** | **4** | **5** | **6** |
| 1. The clinician created a comfortable environment | | | | | | |
| 2. The clinician focused MORE on the procedure rather than on me | | | | | | |
| 3. The clinician showed a LACK of empathy or openness towards my feelings | | | | | | |
| 4. The clinician was uninvolved and dehumanizing | | | | | | |
| 5. The clinician treated me as a mature individual | | | | | | |
| 6. I felt like my treatment was rushed | | | | | | |
| 7. The clinician stayed professional throughout the entire therapy session | | | | | | |
| 8. The communication used by the clinician was empathetic and warm | | | | | | |

Questions derived from: Frattali, C. M. (n.d.). Measuring client satisfaction. American Speech-Language-Hearing Association. Retrieved September 30, 2021, from https://www.asha.org/slp/healthcare/measuring-client-satisfaction/