

Acoustic and Perceptual Measures of Singing Voice Teacher Voice Quality Prior to and After Online Instruction: A Case Study



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Abstract

Some research has indicated that working from home during the COVID-19 pandemic has led to an increase in various measures of vocal fatigue compared to those who have continued to work in person (Siqueira et al., in press). In one investigation, participants experienced an increase in dysphonia and vocal tract discomfort after the transition to working at home (Kenny, in press). This increase was associated with an increase in telecommunication use. One speech-language pathologist uncovered many anecdotes from clinicians experiencing vocal fatigue as a result of virtual meetings with patients (Diaz, 2020). Common symptoms among these practitioners included changes in voice quality, loss of range, voice breaks, and discomfort when speaking.

If increased telecommunication for both non-voice professionals (Kenny, in press) and voice professionals (Diaz, 2020) was associated with increased dysphonia, it is possible this mode of instruction might be particularly fatiguing for other voice professionals, like singing voice teachers.

Therefore, the purpose of this study was to examine the perceptual and acoustical measures of voice quality for a singing teacher prior to and after six different days of virtual online instruction.

References

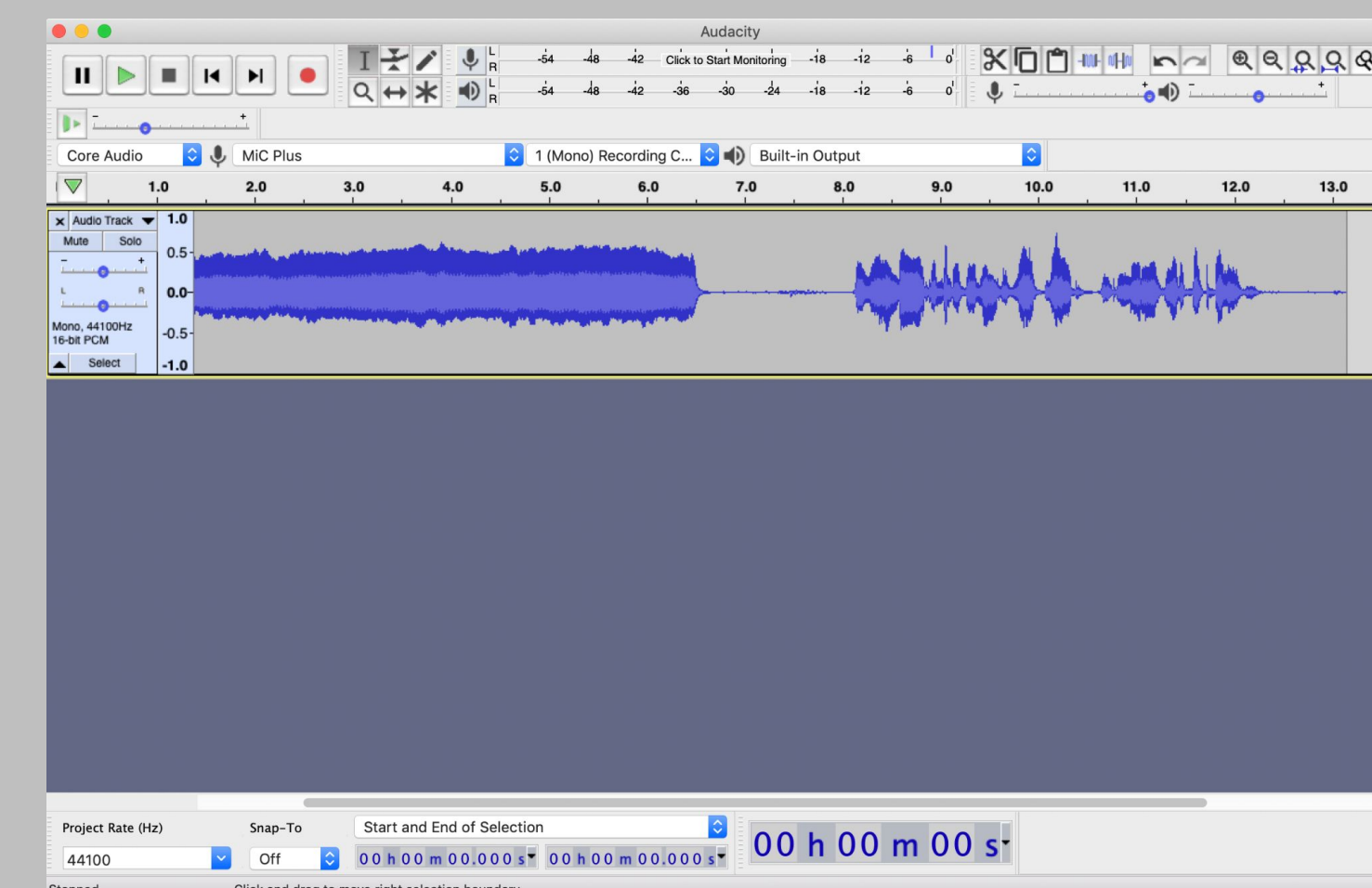
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Learning Outcomes

1. At the end of the presentation participants will understand how one acoustic measure may or may not reveal vocal fatigue following virtual instruction.
2. At the end of the presentation participants will understand how one self-perceived measure may or may not reveal vocal fatigue following virtual instruction.
3. At the end of the presentation participants will be able to formulate future studies related to vocal fatigue during virtual singing instruction, possible mitigation of such fatigue, and possible quantitative differences between virtual and in-person singing instruction.

Procedures

- The singing teacher identified six rigorous days (self-reported) of virtual voice instruction taught through Zoom Videoconferencing Software:
- On each day, prior to teaching:
 - He completed the perceptual Evaluation of the Ability to Sing Easily (EASE) survey
 - He completed the Acoustic Voice Quality Index (AVQI) protocols by recording (WAV file, 16-bit, 44.1 kHz) two tasks on the Audacity audio editor at a mouth-to-mic distance of 30 cm:
 - 1) Sustain an [a] vowel on a single pitch in your speaking range for 5 seconds
 - 2) Read the second sentence of the Rainbow Passage (“The rainbow is a division of white light into many beautiful colors.”)
- He then conducted a day of singing voice instruction: Day One = 6 hours of teaching; Day Two = 5 hours; Day Three = 6 hours; Day Four = 4 ½ hours; Day Five = 5 ¼ hours; Day Six = 6 hours.
- Immediately after the day of teaching, he again completed the EASE survey and the AVQI protocols



Results - Evaluation of the Ability to Sing Easily (EASE)

EASE	Hours Teaching	Pre Total Score / Avg Per Item*	Post Total Score / Avg Per Item*
Day 1	6.0	32 / 1.45	55 / 2.50
Day 2	5.0	26 / 1.18	53 / 2.41
Day 3	6.0	51 / 2.32	64 / 2.91
Day 4	4.5	29 / 1.32	34 / 1.55
Day 5	5.25	28 / 1.27	44 / 2.00
Day 6	6.0	30 / 1.36	46 / 2.09
MEAN	5.46	32.67 / 1.48	49.33 / 2.24

*22 items with 1-4 scale - lower numbers indicate increased function (three reverse-scored items)

Results – Acoustic Voice Quality Index (AVQI)

AVQI	Hours Teaching	Pre	Post
Day 1	6.0	4.09	3.20
Day 2	5.0	3.77	3.06
Day 3	6.0	3.28	3.51
Day 4	4.5	2.58	2.85
Day 5	5.25	2.7	2.5
Day 6	6.0	2.32	3.31
MEAN	5.46	3.12	3.07

*1-10 scale with lower numbers indicating increased voice function

Primary Results / Future Research

Primary findings:

- Acoustic results (AVQI) were largely similar between the beginning of the day and the end of the day (3 days increased quality, 3 days decreased quality, means of 3.12 and 3.07).
- However, the teacher reported a 51% increase in EASE scores, indicating a decrease in self-reported voice ability.
- As such, the acoustic measures did not seem to capture what this participant perceived as increased vocal fatigue at the end of the teaching day
- These results could align with previous research in which higher vocal doses correlated with greater voice intensity, more vocal clarity, and less perturbation (Schloneger & Hunter, 2017)

Suggestions for future research:

- Increased sample size
- Code target behaviors (amount of talking, singing, student singing, etc.) to explore relationship with perceptions of voice ability
- Find additional ways to quantify vocal fatigue:
 - Additional acoustic measures
 - Perform various voice tasks (e.g., Inability to Produce Soft Voice - IPSV)
 - Expert listener perceptions (e.g., CAPE-V)
- Include warmup and cool down procedures, perhaps with SOVTEs