

The Impact of Semi-Occluded Vocal Tract Warm-Up and Cool-Down Procedures on Singing Teacher Voice Fatigue After Online Instruction: A Pilot Study



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Introduction & Procedures

Objectives/Introduction

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). Therefore, the purpose of this study was to examine the impact of semi-occluded vocal tract exercises in vocal warm-up and cool-down procedures on perceptual and acoustical measures of voice quality for a singing teacher prior to and after a rigorous day of virtual online instruction.

Methods/Study Design

On five different days, a singing teacher completed both self-perceptual (Evaluation on the Ability to Sing Easily - EASE) and acoustic (Acoustic Voice Quality Index - AVQI) protocols. He then completed a 10-minute warm-up procedure involving vocalizing on vowels and on a specific semi-occluded vocal tract exercise (SOVTE). The warm-up procedure was the same each day, except the SOVTE changed (straw in water on day one, lip trill on day two, no warm-up on day three, drinking straw on day four, nasal consonants on day five, and stirring straw on day six). He then completed the EASE and AVQI a second time.

Then, after teaching online singing voice lessons for at least 4.5 hours, he completed the EASE and AVQI once more before completing a six-minute vocal cool-down procedure consisting of vocalizing on vowels and using the same SOVTE that was used at the start of the day. Finally, he completed the EASE and AVQI a final time after the cool-down procedure.

On the day when no vocal warm-up was completed, the cool-down procedure included the drinking straw as the SOVTE.

Learning Outcomes

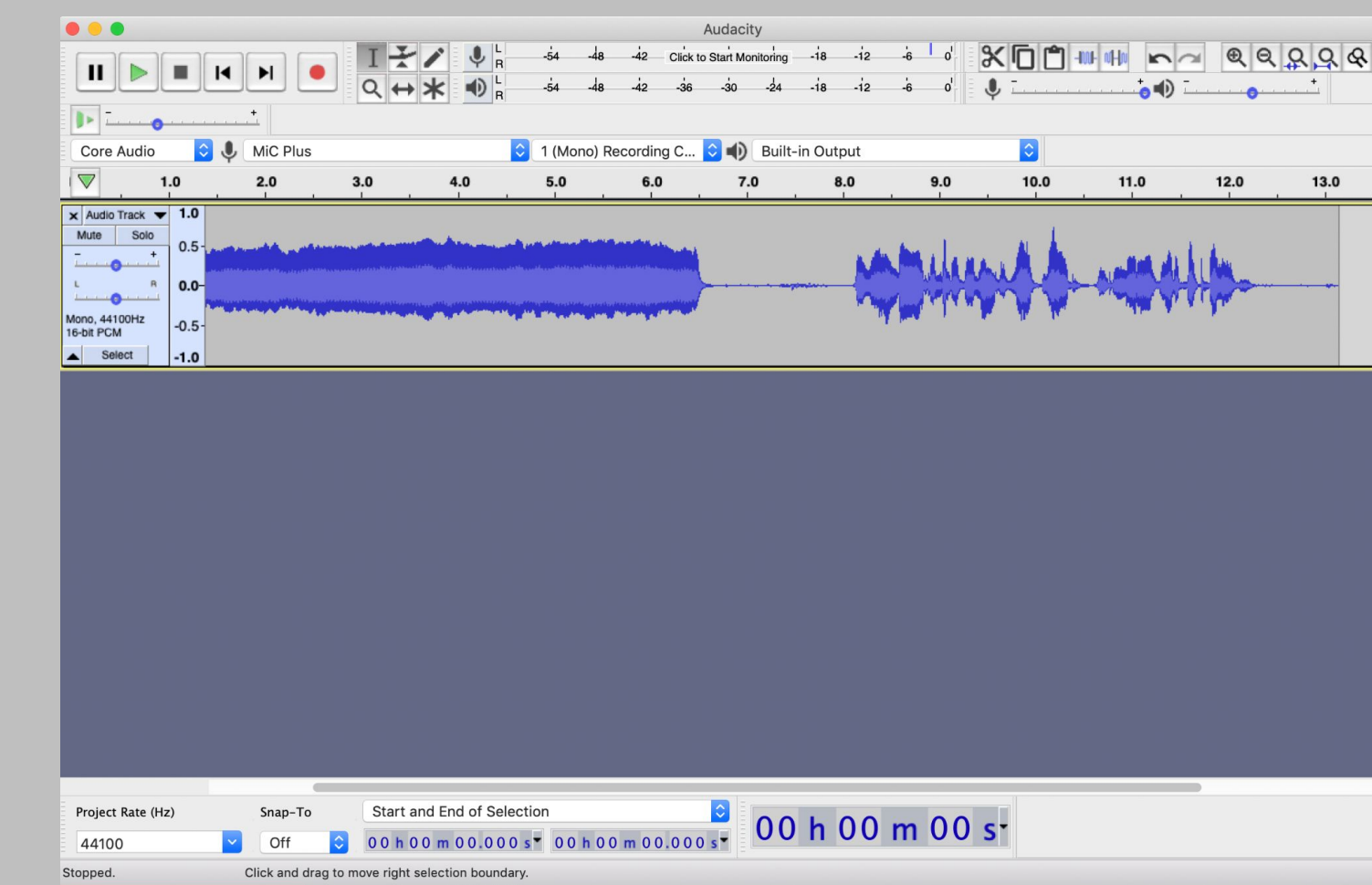
Upon completion of this presentation, the participant should be able to understand if warm-up protocols before online singing voice instruction may help alleviate vocal fatigue when compared to teaching without warming up.

Upon completion of this presentation, the participant should be able to understand if using semi-occluded vocal tract exercises as part of vocal cool-down procedures following rigorous days of online teaching may help alleviate vocal fatigue.

Upon completion of this presentation, the participant should be able to understand how specific semi-occluded vocal tract exercises compare to other semi-occluded vocal tract exercises in their ability to reduce vocal fatigue when part of a vocal warm-up procedure and/or a vocal cool-down procedure.

Analysis

We analyzed pre- and posttest data to determine whether there was a deterioration in overall voice quality due to the demands of virtual voice instruction. We then examined the post-cool down data to see if those procedures ameliorated any post-teaching voice quality deterioration. Finally, we compared the data from the days in which warm-up protocols were completed to the one day when no warm-up protocols were completed.



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

EASE	Hours Teaching	Pre Warm-Up Total Score / Avg Per Item*	Post Warm-Up Total Score / Avg Per Item*	Post Teaching Total Score / Avg Per Item*	Post Cool-Down Total Score / Avg Per Item*
Day 1 (straw in water)	6.0	38 / 1.73	32 / 1.45	55 / 2.50	44 / 2.00
Day 2 (lip trill)	5.0	38 / 1.73	26 / 1.18	53 / 2.41	32 / 1.45
Day 3 (no warm-up/dr. straw cool-down)	6.0	51 / 2.32	No post warm-up	64 / 2.91	45 / 2.05
Day 4 (drinking straw)	4.5	54 / 2.45	29 / 1.32	34 / 1.55	28 / 1.27
Day 5 (nasal consonants)	5.25	44 / 2.00	28 / 1.27	44 / 2.00	57 / 2.59
Day 6 (stirring straw)	6.0	46 / 2.09	30 / 1.36	46 / 2.09	40 / 1.82
MEAN	5.46	45.17 / 2.05	32.67 / 1.48	49.33 / 2.24	41.00 / 1.86

*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 Warm-Up	Post Warm-Up	Post Teaching	Post Cool-Down
Day 1 (straw in water)	6.0	3.52	4.09	3.20	3.63
Day 2 (lip trill)	5.0	4.58	3.77	3.06	1.70
Day 3 (no warm-up/drinking straw cool-down)	6.0	3.28	No post warm-up	3.51	2.65
Day 4 (drinking straw)	4.5	3.42	2.58	2.85	2.53
Day 5 (nasal consonants)	5.25	3.70	2.7	2.5	2.82
Day 6 (stirring straw)	6.0	4.34	2.32	3.31	2.87
MEAN	5.46	3.81	3.12	3.07	2.70

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

Primary Results / Future Research

Primary findings:

- Both acoustic and perceptual measures indicated increased function after warm-up, with the exception of the AVQI measures for straw in water.
- AVQI results were largely similar from after the warm-up to after the day of teaching (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
- However, both acoustic and perceptual measures indicated increased function after cool-down on five of the six days (acoustic and perceptual measures for nasal consonants indicated decreased function).
- Post-teaching results may align with previous research in which higher vocal doses correlated with greater voice intensity, more vocal clarity, and less perturbation (Schloneger & Hunter, 2017).
- The increase in vocal function after warm-up and after cool-down according to acoustic measures also aligns with previous research (Mezzedimi et al., 2018) as does the increase in perceived vocal function after cool-down (Ragan, 2015).
- The fact that not every SOVTE resulted in increased function (acoustic or perceived) may indicate individualized preferences for certain SOVTEs.

Suggestions for future research:

- Increased sample size
- Code target behaviors (amount of talking, singing, student singing, etc.) to explore relationship
- Find additional ways to quantify vocal fatigue, such as additional acoustic measures, performing various voice tasks (e.g., Inability to Produce Soft Voice - IPSV), and including expert listener perceptions (e.g., CAPE-V, GIRBAS).