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Straw Phonation Exercises:
Physiological and Acoustic Impacts and Application Strategies for Barbershop Singers

Introduction

Titze (2006) observed the extensive history of actors, singing teachers, and voice therapists utilizing exercises featuring a partially-closed vocal tract. He coined the term *semi-occluded vocal tract exercises* (SOVTEs) to refer to these vocal tools, examples of which include “lip trills, bilabial fricatives, raspberries, tongue trills, humming, and phonation into tubes or straws” (p. 449). In my work with barbershop ensembles, I regularly utilize SOVTEs to help singers build efficient vocal habits. Although I employ a variety of SOVTEs in different contexts, I have found straw phonation to be particularly effective in inducing vocal efficiency for barbershop ensemble singing. This paper will provide an overview of the literature discussing the physiological and acoustic impacts of straw phonation and recommend strategies that barbershop singers can use to apply straw phonation to their individual practice and ensemble rehearsals.

Physiological and Acoustic Impacts

McCoy (2016) thoroughly outlines vocal fold anatomy and physiology and the phonatory process. He explains that the vocal folds, housed within the larynx, are composed of multiple layers of skin, muscle, and connective tissue. Activity of the lateral cricoarytenoid and interarytenoid muscles closes the glottis, the area between the vocal folds, for phonation. This increases subglottal pressure, which opens the glottis, causing air to flow into the pharynx and decreasing supraglottal pressure. Elastic recoil of the vocal folds, aided by this pressure differential, closes the glottis again. This cycle repeats hundreds or even over one thousand times per second, generating the vibratory waves that resonate in the vocal tract and are ultimately perceived as the sound of a human voice. The vibratory frequency, which determines the pitch, depends in part on the activity of the thyroarytenoid muscle, which shortens and thickens the vocal folds, lowering the pitch, and the cricothyroid muscle, which lengthens and thins the vocal folds, raising the pitch. The vibratory amplitude, which determines the loudness, depends on the vertical thickness of the vocal folds, as well as the ratio of the time the glottis is closed to the period of one glottal cycle, which is referred to as the closed quotient or contact quotient (CQ) (Herbst *et al.*, 2014). Clearly, phonatory efficiency may be impacted by changes in the muscular activity and pressure differentials on which this process depends. Recent research has explored the impact of straw phonation on vocal function, including on these two critical inputs, as well as acoustic output.

Vocal Tract Configuration and Acoustic Output

Laukkanen *et al.* (2012) investigated the impact of straw phonation on vocal tract configuration and the resulting acoustic output, finding that during and following a straw phonation exercise, “the midsagittal area of the vocal tract increased and the velar closure improved” (p. 50) and that “the ratio of the transversal area of the lower pharynx over that of the epilarynx increased both during…and after.” (p. 50). Additionally, they observed a higher amplitude both overall and of harmonics in the speaker’s formant cluster (2,500 - 4,500 Hz), and shifts in the second through fifth formant locations during and after the exercise. Guzmán *et al.* (2013b) conducted a similar study, finding that “the larynx position lowered, and hypopharynx area widened” (p. 523e19), and also corroborated findings of Laukkanen *et al.* (2012) in terms of the impact on the ratio of the areas of the lower pharynx to the epilarynx tube, the increased prominence of the speaker’s formant cluster, and improved velar closure. Kang *et al.* (2019a) later measured the acoustic impacts of straw phonation along with traditional singing exercises such as “body posture alignment and relaxation exercises,...breathing exercises, and…voice production and placement at different pitches, registers, and amplitudes” (p. 420), noting significant acoustic improvements only from the latter. While more research is needed, these findings suggest that straw phonation can improve phonatory efficiency, resulting in vocal output that is perceived as louder without added laryngeal effort. Additionally, to achieve a balance of phonatory efficiency and acoustic improvements, practitioners might consider including both straw phonation and traditional singing exercises in their vocal exercise routines.

Glottal CQ

Gaskill and Quinney (2012) studied the impact of resonance tube phonation - a similar exercise to straw phonation - on glottal contact quotient (CQ), concluding that subjects saw “an increase in glottal CQ during tube phonation, regardless of training or instruction” (p. e86), which “returned to a value near the baseline afterward” (p. e83). Mills *et al.* (2018) similarly observed that straw phonation tends to increase glottal CQ. Conversely, several other studies (Guzmán *et al.*, 2013a; Guzmán *et al.*, 2013b; Andrade *et al.*, 2014) noted decreases in glottal CQ during tube and straw phonation. None of these studies’ findings reached statistical significance, meaning that they are essentially inconclusive. Later research found significant evidence that phonation into various straws and tubes increases glottal CQ (Guzmán *et al.*, 2016; Radhakrishnan, 2022).

Back Pressure and Flow

Andrade *et al.* (2016) investigated the differences in impact on back pressure and flow between eight straws of different dimensions, plus one resonance tube and one silicone tube, finding that back pressure increases as straw length increases, as straw diameter decreases, and as submergence depth increases, all

else equal. Additionally, the authors noted that “for any given straw, the [back pressure] increases as a function of flow. However, for the tubes submerged into water, the [back pressure] starts at the pressure determined by the water depth, which is needed to be overcome for the flow to start” (p. 39). These findings were largely supported by later resonance tube research (Wistbacka *et al.*, 2018). These factors should be taken into account when selecting the type of straw and water depth each singer should use for a straw phonation exercise for maximal impact.

Duration of Impact

Another interesting area of research relates to how long straw phonation impacts last after the conclusion of the exercise, and how long a singer must spend doing the exercise to achieve these impacts. Kang *et al.* (2019a) observed a significant drop in phonation threshold pressure (PTP) following straw phonation, with “PTP decline within 5 minutes, reaching minimum values after 10 minutes,” (p. 426), noting that “5 minutes of straw phonation exposure might be the most cost- and time-effective, whereas 10 minutes may result in the best outcome” (p. 426). Kang *et al.* (2019b) also explored this by measuring various “aerodynamic, electroglottographic, and acoustic metrics” (p. 810e5) periodically for twenty minutes following both a five-minute and ten-minute long straw phonation exercise. This study found a significant PTP decrease after five minutes of straw phonation, which dissipated within five minutes, while the singers experienced a post-exercise increased mean airflow for twenty minutes. After ten minutes of straw phonation, subjects saw similar impacts on PTP and mean airflow, with the PTP decrease lasting more than five minutes. A later study failed to find significant differences in maximum phonation time, self-perceived vocal comfort level, or various acoustic metrics after straw phonation (da Paixao *et al.*, 2021). This study’s methodology differs from those of the previous studies, in that the measurements occurred after shorter periods of straw phonation with interruptions for vocal exertion in between. Since studies like Kang *et al.* (2019a) and Kang *et al.* (2019b) found the most impact occurred after five-to-ten minutes of sustained straw phonation, it would be interesting to repeat the da Paixao *et al.* (2021) study with a modified methodology featuring longer periods of sustained straw phonation to see if the results are more in-line with earlier studies.

Straw Phonation as a Restoration Strategy

Fujiki, Huber, and Sivasankar (2021) compared straw phonation to vocal rest as a restoration strategy following a period of vocal exertion, finding that both strategies improved laryngeal efficiency, but only straw phonation “prevented exertion-induced changes in [lung volume initiation] when a second vocal exertion was performed” (p. 2,485). Thus, they considered straw phonation to be a preferable restoration strategy to vocal rest for singers who anticipate another period of vocal exertion following the intervention. This suggests that the duration of the straw phonation regimen may impact how long a singer enjoys improved vocal efficiency

after completing the exercise, and also that periodic straw phonation interventions throughout a rehearsal may help singers reachieve phonatory efficiency once the positive impacts begin to degrade.

Straw Phonation in Ensembles

Jeremy Manternach and various collaborators have tested the impact of straw phonation on sound pressure level (SPL), as well as self-assessed quality of sound and ease of singing in ensemble settings. Manternach, Schloneger, and Maxfield (2019) observed that after straw phonation, an SSAA ensemble saw an increase of "more than 1 dB SPL…across the entire [frequency] spectrum" (p. 465). Manternach, Kotsonis, and Mann (2022) noted similar findings with SSAA and SATB ensembles, and their participants also felt they sang more efficiently and sounded better after the exercise. Manternach and Daugherty (2019) similarly noted that participants in a SATB ensemble felt their singing sounded better and became more efficient after a straw phonation protocol, but the spectral energy impact was inconclusive. Manternach and Clark (2018) also found similar results with a TTBB barbershop chorus: the ensemble experienced an approximately 1 dB SPL increase in spectral energy, and the singers reported an improved sound and increased vocal efficiency following straw phonation. Together, these studies suggest that straw phonation benefits translate to various styles of ensemble singing. Accordingly, choral leaders "may wish to use straw phonation exercises to increase choral output and reduce vocal effort," (Manternach, Schloneger, and Maxfield, 2019, p. 465).

Inconsistent Results Across Subjects

Despite the trends outlined in the literature, the impact of straw phonation exercises and SOVTEs more generally is not uniform for all singers. Dargin, DeLaunay, and Searl (2016) found inconsistent impacts of straw phonation, lip trills, and tongue trills on various measures of glottal function and pharyngeal constriction across subjects. Another study focused on musical theatre singing found similarly inconsistent results across subjects for a variety of SOVTEs, including straw phonation (B. Manternach, Maxfield, and J.M. Manternach, 2021). The authors noted that "it may take some sleuthing for voice teachers to…discover which exercise is most effective for each student…teachers and singers may wish to vary SOVTEs used in lessons and in practice sessions to potentially experience the most robust benefits" (p. 47-48). This inconsistency demonstrates that despite compelling evidence of the impact of straw phonation in general, it is likely not the optimal choice for every singer in every context, and a variety of SOVTEs should be considered.

Application Strategies for Barbershop Singers

There is considerable evidence that straw phonation encourages efficient phonation, that its benefits persist after completion of the exercise, and that its benefits also translate to an ensemble setting. Many barbershoppers have accordingly embraced straw phonation as a valuable tool that is useful in a variety of practice or rehearsal situations.

While art is subjective, the barbershop community has a strong contest-oriented culture, meaning there are contest rules that outline the kind of singing that is rewarded in barbershop contests. According to the Barbershop Harmony Society's Contest and Judging Manual, "The Singing judge evaluates the degree to which the performer achieves artistic singing in the barbershop style" (2023, p. 7-1), noting that barbershop ensembles aim to sing in just intonation, which "reinforces those harmonics (overtones) that are common between any two pitches" (p. 7-2), and listing several other elements of artistic singing, including a freely-produced sound featuring "healthy and consistent vocal fold closure" (p. 7-3). A barbershop ensemble has the best potential for overtone reinforcement when singers in all four voice parts are singing efficiently with balanced vocal fold closure as a baseline. Since this is precisely what straw phonation tends to encourage, it can be an incredibly useful exercise to induce the kind of phonation associated with success in the barbershop style, in contests and beyond.

Following the structure of a standard barbershop ensemble rehearsal, there are several opportunities throughout to utilize straw phonation to improve individual and ensemble vocal output.

Vocal Warm Ups and Skill Building Exercises

Performing a sequence of lip trill, humming, and straw phonation exercises has been found to reduce extrinsic laryngeal activity (Savareh *et al.*, 2023). Thus, incorporating straw phonation into the vocal warm up and skill building session that occurs at the beginning of a typical barbershop ensemble rehearsal may help increase singers' vocal efficiency from the outset. Since this research involved multiple different SOVTEs and other studies have found inconsistent results for specific SOVTEs across subjects (Dargin, DeLaunay, and Searl 2016; Manternach, B., Maxfield, and Manternach, J.M. 2021; Maxfield *et al.*, 2015), it seems prudent to either utilize multiple different SOVTE postures or allow singers to choose an SOVTE that they feel best promotes ease and efficiency in their voice, rather than utilizing only one posture each time a SOVTE is employed. This should help maximize the impact of the session for as many singers as possible. Singers may need to experiment to identify which SOVTE(s) they prefer, and their preference may vary across their range, over time as their voice develops, or due to other health and environmental factors such as hydration level, allergies, and illness which all stand to impact overall vocal function. I generally provide opportunities in my warm up sessions for singers to perform multiple different SOVTEs or to select their own, and will continue doing so based on this research.

Additional evidence suggests that best results are achieved following a SOVTE routine lasting between five and ten minutes (Kang *et al.*, 2019a; Kang et. al, 2019b). Recognizing how precious each moment of rehearsal time is, I typically incorporate about five minutes of SOVTE-based exercises in the routines that I lead, and have found this to be effective.

Kang *et al.* (2019b) also conclude that some benefits of straw phonation may persist for some time following conclusion of the exercises. Thus, performing straw phonation exercises at the beginning of rehearsal

can facilitate greater vocal efficiency in the ensuing minutes. Further research is warranted to help us better understand how long increased vocal efficiency from SOVTEs typically lasts.

Kang *et al.* (2019b) observed significant acoustic impacts only for traditional vocal exercises, not straw phonation. This further underscores the importance of a well-rounded warm up routine that includes not only SOVTEs of multiple varieties, but also other non-SOVT singing exercises for maximum impact. Two example vocal warm up and skill-building exercises routines that take these research findings into account are provided in Appendices A and B, but the possibilities are quite extensive given the wide range of possible exercises and pitch patterns.

Vocal Resets

Barbershop rehearsals often last approximately three hours, which is a substantial vocal load for most singers, some of whom may experience vocal fatigue before the end of rehearsal. Though vocal fatigue increases vocal effort, both straw phonation and vocal rest can help return vocal effort to pre-fatigue levels (Fujiki, Huber, and Sivasankar, 2021). Therefore, interspersing straw-phonation based vocal reset sessions or vocal rest breaks throughout barbershop rehearsals may help to recalibrate singers' voices to more efficient function as fatigue sets in.

An interesting area of potential future research would be to investigate the impact of differing vocal reset strategies. This could help us understand how variables such as the specific SOVTE(s) utilized and the frequency and duration of the intervention impact vocal efficiency throughout a rehearsal.

Application to Repertoire

When barbershop ensemble members encounter phonatory inefficiencies such as overly pressed or breathy phonation, phonatory inconsistency, or registration events, SOVTEs - including straw phonation - can be effective in encouraging efficient and consistent phonation and transferring these positive outcomes to normal singing. Variability observed in objective measurements like pressure levels and air flow of different SOVTEs across subjects (Dargin, DeLaunay, and Searl 2016; Manternach, B., Maxfield, and Manternach, J.M. 2021; Maxfield *et al.*, 2015). suggest a preference for certain SOVTEs in certain situations, depending on not just the specific vocal inefficiency the exercise is meant to address, but idiosyncrasies of the singer themself.

When attempting to address pressed phonation with a singer or ensemble, I typically start with an SOVTE associated with a higher level of intraoral pressure such as straw phonation (Maxfield *et al.*, 2015), switching to one with a lower level of pressure, if needed. Conversely, when attempting to address breathy phonation, I tend to start on the other end of the spectrum, with an SOVTE with a lower degree of intraoral pressure such as a nasalized consonant (Maxfield *et al.*, 2015). When attempting to address phonatory inconsistency like registration events, I often ask singers to utilize a SOVTE of their choice, or try multiple

different SOVTEs to see which one is most effective for them in that moment, given the variability seen in the literature.

In terms of application strategy, I generally have found it effective to have the singer or ensemble alternate between going through a problematic passage on an SOVTE at least twice until they begin to experience some benefit, and then encourage them to alternate between repeating the exercise and normal singing, with a focus on trying to bring the improved efficiency from the exercise into their normal performance.

Vocal Cooldowns

Although vocal warm ups are a common practice among singers and ensembles, fewer singers seem to habitually perform vocal cooldowns. Gish *et al.* (2012) found that while 54% of voice students and professional singers surveyed always performed a vocal warm up prior to singing, only 22% performed vocal cooldowns after singing. Since it is apparently not a common practice among current and future singing professionals, the rate of vocal cooldown practice among barbershoppers, most of whom sing only avocationally, is likely even lower.

However, there is some limited evidence that practicing vocal cooldowns involving certain SOVTEs is beneficial. Ragan (2016) found that singers felt an increased sense of vocal well being following a vocal cooldown that featured several SOVTEs, including straw phonation. The findings of Fujiki, Huber, and Sivasankar (2021) can also be applied to the end of a rehearsal, where we would expect both straw phonation and vocal rest to help restore fatigued voices to their baselines.

I encourage singers and ensembles to practice vocal cooldowns to help to calibrate their voices back to efficient voicing for speaking following a singing session, and anecdotally they have also found it beneficial. An example of a vocal cooldown routine based on straw phonation and other SOVTEs is provided in Appendix C, but similar to vocal warm ups, the possibilities are quite extensive, so variation is recommended.

Conclusion

There is a wealth of evidence that points to the efficacy of straw phonation. Many researchers have found that straw phonation increases phonatory efficiency, that this greater efficiency persists beyond completion of the exercise resulting in subsequent efficient phonation, and that these impacts are also seen in ensemble settings and in various styles of music. Although more research is warranted to understand finer details like the impact of straw phonation versus other SOVTEs and the duration of persisting benefits from straw phonation sessions of various durations and following various vocal loads, there are many opportunities throughout a barbershopper's individual practice and ensemble rehearsals to utilize straw phonation for increased vocal efficiency. While straw phonation is not necessarily the best SOVTE choice for all singers, and SOVTEs in general are not the best choice for every possible vocal inefficiency, their flexibility and ease of application make them an invaluable tool for barbershoppers who strive to sing with their most efficient voice.

Critical Reflection

The practice of critical reflection is crucial for continued growth and development in any discipline. I was initially drawn to the models proposed by Driscoll (2007), Kolb (2015), Jasper (2013), and Schön (1991), finding each one to be elegant in its simplicity, and that each set the stage nicely for forming new attitudes and behaviors based on the learnings from my Module 1 work. I ultimately selected Driscoll's What? Model (2007) as it seemed to be most naturally aligned with the way I informally reflect on experiences in my daily life.

What?

I began writing this paper with preconceived notions about the impacts of straw phonation on the voice, based on classes I have taken, the research I did for my Formative Assignment, and other independent learning. My preconceived notions were largely supported by the research discussed above, as I had the understanding that straw phonation tends to improve phonatory efficiency. I also had personal experience that no singular SOVTE is optimal for all people in all situations, and that each singer tends to have their own preferences on which ones work best for them, which is supported by several studies discussed above (Dargin, DeLaunay, and Searl 2016; Manternach, B., Maxfield, and Manternach, J.M. 2021; Maxfield *et al.*, 2015). However, one thing that struck me was the number of studies I encountered that failed to find a statistically significant impact of straw phonation on their measures of interest (Andrade *et al.*, 2014; Gaskill and Quinney, 2012; Guzmán *et al.*, 2013a;, Guzmán *et al.*, 2013b; Mills *et al.*, 2018). I got the impression from previous courses and independent learning that findings on straw phonation and SOVTEs more broadly were far more definitive than they appear to be. Further, despite lacking statistically-significant evidence, some of these studies still drew conclusions that straw phonation indeed did have an impact on the areas studied. It was surprising to see peer-reviewed and published papers draw these conclusions without strong evidence of causality.

So What?

After completing this assignment, I am left with four primary takeaways. The first is a reaffirmation that there is a strong scientific backing for utilization of straw phonation and other SOVTEs in singing practice, including in barbershop ensemble rehearsals. Although not every relevant study reported significant findings, there is compelling evidence that SOVTEs promote efficient phonation for singing.

Additionally, given the demonstrated variability in effectiveness of different SOVTEs across subjects, I feel that it is a good practice to provide singers the freedom to experiment and find SOVTEs that work best for them or utilize a variety of SOVTEs throughout a session, rather than being overly prescriptive and restrictive on which ones they should or should not use.

Thirdly, the findings of Kang *et al.* (2019b) suggest that non-SOVT exercises may provide beneficial impacts that SOVTEs do not. This implies that utilizing both SOVTEs and other non-SOVT singing exercises in vocal warm ups and skill building sessions may have a broader impact than relying solely on SOVTEs. In the

past, I have at times leaned very heavily on SOVTEs in my warm up and skill building routines, and findings like these remind me of the prudence of taking a more balanced approach and using a wider variety of exercises for maximum impact.

Finally, I have a greater appreciation for the need to remain skeptical and critical of research methodology and findings in future academic endeavors. Given that some similar studies - for instance, Kang *et al.* (2019a) and Kang *et al.* (2019b) versus da Paixao *et al.* (2021) - draw contradictory conclusions, it is important to take into account differences in methodology and analysis that may have led to this. Also, since some authors may draw conclusions that are not supported by statistically-significant findings, it is important to review each paper closely and not simply take the conclusion section at face value without scrutinizing the methodology and analysis. Fernandez (2019) provides a helpful framework for reviewing literature critically to identify any potential biases and assess trustworthiness of various articles.

Now What?

Based on these learnings, I will continue to utilize straw phonation and other SOVTEs in my work with barbershop ensembles, including in warm up and skill building sessions, periodic vocal resets throughout rehearsal, vocal cooldowns, and interventions in repertoire when the ensemble is experiencing phonatory inefficiency. In particular, I will incorporate at least two different SOVTE postures into each routine or give the singers the autonomy to choose their own, and also employ other non-SOVT singing exercises to ensure a balanced approach. Since most of my work is in ensemble settings, it is generally quite difficult to give individual feedback, so I need to clearly articulate the proper technique for each exercise, as well as desired impact, so that individuals can reliably self-monitor and choose the option that is most impactful for them. Where possible, I will also work with ensemble singers individually to cater my advice and instruction to their own specific needs and learning styles.

Additionally, in future critical evaluation of others' research, I will be careful to scrutinize the research methodology, as well as the conclusions drawn versus the data collected and analysis performed. Just because a paper was peer-reviewed and published does not necessarily mean the conclusions articulated are backed by strong evidence. I will familiarize myself with best practices outlined by experts like Fernandez (2019) to strengthen my own skills in critically evaluating research moving forward.

Appendix A

Example Vocal Warm Up/Skill Building Routine Utilizing Straw Phonation, Other SOVTEs, and Non-SOVT Exercises		
Exercise	**Pitch Pattern**	**Notes**
/v/	1-2-1-7-1	● Start low in range and ascend by semitones. ● Encourage sliding between notes, rather than cleanly hitting each pitch. ● Encourage smooth and consistent sound and airflow, as opposed to rearticulating or pulsing on each pitch change. ● Note that this should feel very easy and relaxed.
SOVTE of choice	1-5-1	● Start low in range and ascend by semitones. ● Note that the goal is to achieve a slow, consistent slide in both directions. ● Caution singers to monitor for tension in their neck, tongue root, jaw, and lips and focus on keeping these areas as relaxed as possible. ● Encourage smooth and consistent sound and airflow, as opposed to rearticulating or pulsing on each pitch change ● Encourage singers to experiment with different SOVTE postures to find the ones that work best for their voice.
Straw phonation into water	1-2-3-4-5-4-3-2-1	● Start low in range and ascend by semitones. ● Note that singers should strive for consistent airflow and can monitor the rate of bubble formation in the water. ● Note that this should feel very easy and relaxed, with a massage-like sensation at the vocal folds. ● Caution singers to ensure that no air is leaking from their nose or from between their lips and the straw. ● Note that singers can adjust pressure level if needed by changing straw depth. The desired pressure level may differ based on pitch. If even the shallowest possible depth induces too much pressure, singers can switch to a wider straw, if available, or omit the water.

/sɪŋ/-/ɑ/	5-5-4-3-2-1	● Start low in range and ascend by semitones. ● Instruct singers to move to and hold the /ŋ/ sound for the first pitch. ● Instruct singers to open to the /ɑ/ vowel for the second note of the exercise and maintain that vowel as consistently as possible through the rest of the exercise. ● Encourage singers to physically change as little as possible between the /ŋ/ and /ɑ/ sounds.
/miaʊ/	1-3-5-8-8-8-8-5-3-1	● Instruct singers to rearticulate the word on each pitch. ● Encourage singers to strive for twang-like quality in the vowel and maintain that throughout the exercise. ● Emphasize that the goal of this exercise is not to sing at a loud volume, but to achieve a bright resonance which is aided by twang. ● Encourage singers to monitor level of laryngeal effort to ensure it is kept low throughout the exercise. ● Encourage singers to be playful and utilize gestures to embody a cat.

Appendix B

Example Vocal Warm Up/Skill Building Routine Utilizing Straw Phonation, Other SOVTEs, and Non-SOVT Exercises		
Exercise	**Pitch Pattern**	**Notes**
Lip trill	1-2-1-7-1	● Start low in range and ascend by semitones. ● Encourage sliding between notes, rather than cleanly hitting each pitch. ● Encourage smooth and consistent sound and airflow, as opposed to rearticulating or pulsing on each pitch change. ● Note that this should feel very easy and relaxed. ● Encourage singers that are having difficulty performing a lip trill to gently pinch their cheeks to encourage relaxation.
/m/	1-3-1	● Start low in range and ascend by semitones. ● Note that the goal is to achieve a slow, consistent slide in both directions. ● Caution singers to monitor for tension in their neck, tongue root, jaw, and lips and focus on keeping these areas as relaxed as possible. ● Encourage smooth and consistent sound and airflow, as opposed to rearticulating or pulsing on each pitch change. ● Encourage forward-focused resonance throughout the exercise.
Straw phonation	1-5-1	● Start low in range and ascend by semitones. ● Note that singers should strive for consistent airflow throughout the exercise. ● Note that this should feel very easy and relaxed. ● Caution singers to ensure that no air is leaking from their nose or from between their lips and the straw. ● Note that singers should adjust pressure level if needed by pinching the end of the straw. The greater the degree of pinch, the more back pressure they will experience.

/mi/-/mɛ/-/mɑ/-/mo/-/mu/	5-3-4-2-3-1-2-7-1	● Start low in range and ascend by semitones. ● Instruct singers to go immediately to the vowel as the target, and stay on each syllable for two pitches, except /mu/ which only gets one pitch. ● Encourage singers to monitor jaw and lip movement and keep them to a minimum, allowing tongue position and shape changes to change the vowel. ● Encourage singers to maintain a forward-focused resonance and a high tongue position.
/næ/-/næ/-/næ/-/næ/-/næ/-/næ/-/næ/	5-5-3-6-5-3-5-1 (slide)	● Instruct singers to rearticulate the word on each pitch, except the last one, sliding from 5 down to 1 ● Encourage singers to strive for twang-like quality in the vowel and maintain that throughout the exercise. ● Emphasize that the goal of this exercise is not to sing at a loud volume, but to achieve a bright resonance which is aided by twang. ● Encourage singers to monitor level of laryngeal effort to ensure it is kept low throughout the exercise. ● Encourage singers to be playful and embody a child teasing their friend on the playground.

Appendix C

Example Vocal Cool Down Exercises Based On Straw Phonation and Other SOVTEs		
Exercise	**Pitch Pattern**	**Notes**
/ŋ/	Swirling Siren	● Start at top of range and gradually work way down to the bottom of the range. ● Note that this should feel very easy and relaxed. ● Note that singers can increase the pressure level if needed by pinching their nose. The harder the pinch, the higher the pressure.
Straw phonation into water	Single sustained pitch with slight variation	● Sustain exercise gently around normal speaking pitch, varying pitch slightly as desired. ● Note that singers should strive for consistent airflow and can monitor the rate of bubble formation in the water. ● Note that this should feel very easy and relaxed, with a massage-like sensation at the vocal folds. ● Caution singers to ensure that no air is leaking from their nose or from between their lips and the straw. ● Note that singers can adjust pressure level if needed by changing straw depth. The desired pressure level may differ based on pitch. If even the shallowest possible depth induces too much pressure, singers can switch to a wider straw, if available, or omit the water.
/m/	Descending slide	● Imitate puppy whimpers, sliding down slowly to vocal fry, with progressively lower starting pitches (near top of comfortable range, just above speaking pitch, at speaking pitch, just below speaking pitch, etc.) ● Encourage forward-focused phonation with fronted, high tongue position. ● Note that this should feel very easy and relaxed. ● Encourage singers to be playful and utilize gestures to embody a puppy.

Appendix D

Personal Development Plan			
Goal	**Action(s)**	**Specific Skill(s) Addressed**	**Target Completion Date**
Improve skills in practically applying SOVTEs	• Watch Voice Study Centre Short Course “SOVT Exercises: What, How, When, and Why?” with John Nix	• Knowledge of proper SOVTE technique • Knowledge of which SOVTEs are best in which scenarios • Knowledge of how to best instruct and coach singers to utilize SOVTEs for maximum impact	June 2024
Improve general pedagogical skills	• Watch Voice Study Centre Certificate in Applied Neuroscience and Voice Courses with Heidi Moss	• Knowledge of teaching strategies to best position singers for understanding and retention of content presented • Knowledge of motor learning for optimal design of exercises and routines	September 2024
Improve skills in real-time individual coaching	• Reiterate offer to provide private vocal instruction to Vocal Confluence members upon request • Continue working with Vocal Confluence members referred to me by other members of leadership for additional support	• Ability to apply theoretical voice pedagogy knowledge in real-time to help individuals continue to grow and develop vocally • Ability to listen critically and quickly identify best areas for improvement to focus on in coaching individuals • Knowledge of which tools are most impactful in which situations, and how to implement them effectively • Ability to build rapport with individuals to help create a safe, comfortable environment for learning	December 2024

Improve skills in real-time ensemble coaching	● Work with Artistic Director of Vocal Confluence to establish regular cadence for me to coach chorus during rehearsal ● Reiterate offer to coach quartets and other small ensembles made up of Vocal Confluence members upon request ● Post publicly on social media and/or reach out to outside ensembles directly inquiring about coaching opportunities	● Ability to apply theoretical voice pedagogy knowledge in real-time to help ensembles continue to grow and develop vocally ● Ability to listen critically and quickly identify best areas for improvement to focus on in coaching ensembles ● Knowledge of which tools are most impactful in which situations, and how to implement them effectively ● Ability to build rapport with ensembles to help create a safe, comfortable environment for learning	December 2024

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