A critical view of the yawn-sigh as a voice therapy technique

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The yawn-sigh as a voice therapy technique has had increased usage in recent years, particularly with voice problems related to vocal hyperfunction. The technique appears to be especially effective in counteracting the tension symptoms of elevated larynx and constricied vocal tract that so often characterize vocal hyperfunction (1). Froeschels (2) in 1952 labeled the voice produced with such excessive tensions as -hyperfunctional dysphonia. Boone and McFarlane (3) defined voice hyperfunction "as the involvement of too much muscle force and physical effort in the systems of respiration, phonation, and resonance. After summarizing some of the early literature descriptions of vocal hyperfunction, Brodnitz wrote that -natural functions to overcome vocal constriction are the sigh and the yawn- , both useful in overcoming. the upward pull of the larynx. This present study takes a critical look at the physiologic characteristics and acoustic effects of the yawn-sigh, and then offers suggestions for its application in the treatment of voice disorders.

Simply put, vocal hyperfunction is using too much force and effort while voicing. Instead of using the term "vocal hyperfunction in his writings, Aronson (5) described these same behaviors and symptoms as a musculoskeletal tension disorderthat is typically characterized by an elevated hyoid bone and larynx. He further wrote that "the extrinsic and intrinsic laryngeal muscles are exquisitely sensitive to emotional stress, and their hypercontraction is the common denominator behind the dysphonia and aphonia in virtually all psychogenic voice disorders". He believes the primary treatment for such musculoskeletal tension is "maneuvering the patient's laryngeal and hyoid anatomy to promote greater vocal tract relaxation and to lower the position of the larynx. These maneuver procedures, which include gentle pressure and massage (the procedures are well specified in Aronson's writings), are similarly described and urged as a primary treatment modality for vocal hyperfunction by Prater and Swift (6).

The tense voice is often described in the literature as a voice produced with poor breath support, elevation of the hyoid bone and larynx, mandibular restriction, unnecessary tongue tension, and overall vocal tract constriction. Part of such tract constriction was described by Colton and Casper (7) as anterior-posterior laryngeal squeezing where the "epiglottis and the arytenoids approach each other during phonation". Literature descriptions (3,6,8) of tense vocal physiology are usually accompanied by therapy techniques designed for reducing such laryngeal and vocal tract tensions, such as chant talk, chewing, glottal fry, initiating phonation with the /h/ sound, the open mouth, sighing, and the yawn-sigh. Each of these vocal techniques are designed to open up the vocal tract, permitting an easier phonation with a minimum of muscular effort.

Much of the voice therapy program developed by Boone and McFarlane (3) is designed to reduce vocal hyperfunction, with the yawn-sigh often used as a method for relaxing the vocal tract, opening up the pharynx, and lowering the larynx. Instead of using the massage maneuver (5) to lower the larynx, Boone has observed clinically that the yawn-sigh will not only lower their larynx, but keep the larynx in a low position while the patient continues using the sigh mode of phonation. Among Boone and McFarlane's 25 therapy-facilitating approaches is the yawn-sigh, described as "a powerful voice therapy technique for patients with vocal hyperfunction. Procedures for using the yawn-sigh are specified, which include an explanation of what the technique can accomplish for the tight voice, followed by direct clinician modeling of the method. With the explanation and the modeling, most (but not all) children and adults with voice problems are able to yawn and follow the yawn with a relaxed, vocalized expiration (the sigh).

Pershall and Boone (9) developed clinical concern that many of their voice patients had

such a squeezing of the larynx by hyperactivity of the aryepiglottic folds that it was almost impossible to view fiberoptically the vocal folds below. As part of their study looking at supraglottal constriction, they took a number of computed tomography (CT) scans of the neck and mandible of their research colleagues doing various vocal tasks. In Fig. 1, we see the CT scans of the same subject vocalizing EEH /i/ (Fig. 1a), the barker voice (similar to belting), and in Fig. 1b, a sighed voice after a yawn. The scans were taken at the level of the third cervical vertebra, which placed the focus of the scan just above the arytenoids. In Fig. 1, in each of the CT scans we identify the white bone at the bottom of the picture as the third cervical vertebra; the dark central area is the open airway. The sighed -E- (/i/) produced the most maximally dilated pharynx of all tasks performed by all subjects. The CT scans confirmed the flexible endoscopic observations of Pershall and Boone, which showed that the yawn-sigh produced marked pharyngeal widening consistently across research subjects. Clinically, it was observed that with the descent of the larynx, the yawn usually opened up the squeezed larynx.

Colton and Casper (7) have observed fiberoptically that the larynx lowers dramatically-during a true vegetative yawn. They report, however, that some patients have difficulty initiating a yawn; they speculate that this may be because people tend to be socialized into hiding and stifling public yawns. They do recommend, however, the natural yawn as a way of eliminating abusive initiation of phonation and for reducing laryngeal tensions. In 1990, Casper et al. (10) reported that no subject was able to produce the yawn when the tongue was anchored down, which was necessary in examining the patient with use of a rigid endoscope; subsequently, similar to Pershall and Boone, they have studied the yawn-sigh using a flexible fiberoptic bundle. They have found in those subjects who can complete the procedure that the larynx descents markedly and remains in the lowered position during the initiation of the sigh (with a gradual ascent back to the starting position).

Boone has embraced the yawn-sigh as a technique for relaxing the vocal tract, to be used situationally by tense speakers. In his self-help book (11) for voice self-improvement, he introduces the "invisible yawn-sigh- as a method for relaxing the vocal tract in public situations (on the speaker's platform, at a meeting, etc.). The patient keeps his mouth closed and yawns; then he lets the air out with a closed-mouth sigh (the air exits silently through the nose). Even this modified yawn-sigh appears to lower the larynx and dilate the pharynx, producing a more relaxed vocal tract and a more relaxed-sounding voice.

The yawn-sigh has had a host of clinical advocates. Moncur and Brackett (12) encouraged the use of the breathy yawn-sigh for treating persons with "hypervalved larynxes and hypertense muscles." Wilson (13) incorporated the sigh with other therapy techniques for children with hyperfunctional voice problems. Moore (14) wrote that in reducing excessively tense phonation, general relaxation procedures coupled with a -vocalized sigh- will often produce a relaxed phonation. The sigh is used by Greene and Mathieson (15) in this manner, ie., after a period of relaxed diaphragmatic breathing the patient vocalizes on a deep sigh on the expiratory airstream.

In this study we attempt to answer these two questions: (a) What are the physiologic mechanisms and the acoustic characteristics of the yawn-sigh? (b) Why is the yawn-sigh a useful therapy technique for reducing vocal hyperfunction?

METHODS

Subjects

Eight normal subjects were recruited in a university setting, three women and five men, ages 29-64 years (mean = 46). None of the subjects had a history of laryngeal disease or a voice problem.

Procedures

Before endoscopic examination, each subject was instructed as follows: We are interested in seeing how normal people yawn and sigh. Furthermore, we are interested in seeing what happens in your throat when you sigh and make a sound at the same time. The subject was then instructed to imitate the models of the examiner. First, the subject was asked to swallow (for an external view of possible larynx elevation). Second, the subject imitated an extended production of the vowel /i/. Next the subject produced an exaggerated yawn, followed by a sustained, sighed /i/. A similar procedure was followed for production of /a/ under normal and sigh conditions. The nasoendoscopic procedure was not started until the subject could demonstrate the ability to produce an exaggerated yawn followed by sighed phonation of both /Y and /al.

Each subject was examined with a flexible fiberendoscope (Machida 3L with Machida RH-150A3 light source) placed nasally until the scope lens extended to just below the uvula in the posterior pharynx. This permitted a full view of the pharynx leading into the laryngeal aditus, providing a view of the larynx. The endoscope was coupled to a Panasonic CD- 110A video camera, which was connected to a JVC HR-D670U video cassette recorder. A videotape was made for each subject producing two vowels, /i/ and /a/ under two conditions: with normal voice and on a sigh after an exaggerated yawn.

Acoustic analyses of both vowels specific to fundamental frequency and formant distribution were not possible from the video recordings of the subjects' productions during endoscopy, primarily because of the contaminating noise of the light source. Therefore, each subject recorded the vowels /i/ and /a/ under two conditions (normal and sigh) on a high-quality TEAC W-550R audio recorder with an HX-PRO system; a spectral analysis of each vowel production was then completed, identifying fundamental frequency and formant distribution, using a Sun Microsystem, SUN 4/330.

RESULTS

Despite examiner modeling, one of the eight subjects (a 42-year-old woman) was unable to produce a yawn-sigh. Her larynx at rest appeared to be in its lowest position, rising for phonation under both normal and the attempted-sigh conditions. All seven other subjects were relatively similar in pharyngeal changes and laryngeal movements as viewed on endoscopic examination. A graphic summary of the study results may be seen in Fig. 2 for the seven sub ects when producing the yaswn-sigh: The tongue tip is down and retracted With the tongue body held in a high, retracted position; the pharynx is noticeably widened; the larynx moves down. The pharyngeal widening in these subjects was similar to the CT-scan pharyngeal dilation seen in Pershall and Boone's earlier study (9). Laryngeal descent was confirmed by external viewing of the neck, showing the descending larynx under the yawn-sigh condition in both male and female subjects. The neck skin was marked at the level of the laryngeal thyroid notch with the larynx in the rest position; vertical laryngeal ascent and descent could be seen occurring above and below the skin mark. Because clear lateral and vertical changes were seen in pharyngeal-laryngeal positioning, the

overall physiology of the movements was observed and recorded with no attempt made to measure actual distance values.

An acoustic analysis of each subject's production of the vowels /i/ and /a/ under two conditions (normal and sigh) yielded information specific to fundamental frequency and the acoustic foci of formants 1, 2, and 3. However, because some data were lacking on the /a/ vowel for several subjects, only the /i/ vowel data were summarized and may be seen in Table 1. The fundamental frequency data were not remarkable, with most subjects keeping the F(relatively constant between the two conditions.

It should be noted that subject 6 was unable to produce what the examiners considered to be a valid sigh. Despite examiner modeling, she could not sigh. On videoendoscopy, she showed no différence in physiology of production between normal and her attempted sighed vowels; acoustically there were only minimal différences in her Fo and formant frequency values.

The other seven subjects showed similar formant frequency patterns. Formant 1 in both vowels did not vary consistently across subjects under the two conditions (normal and sigh). All seven subjects experienced a marked drop of the formant 2 under the sigh condition. Formant 3 was also depressed in all subjects but subject 7, who showed a surprising elevation in formant 3 frequency. As can be seen in Table 1, for male subjects 1, 3, and 8, the formant 3 values were found to drop considerably under the sigh condition.

DISCUSSION

A frequent undesirable vocal behavior in vocal hyperfunction is elevation of the larynx and constriction of the supraglottal airway. Two commonly used therapy approaches for reducing this vocal tract tension are the maneuver-massage methods described by Aronson (5) and the yawn-sigh as often described in the voice therapy literature (3,7). Although both approaches have the effect of lowering the larynx, only the yawn-sigh has been demonstrated (9,10) to also increase the horizontal dimensions of the airway. For the seven subjects in this study who could perform. the yawn-sigh, each experienced a lowering of the larynx and widening of the pharynx under the sigh condition.

How does lowering the position of the larynx influence the horizontal widening of the pharynx ? Some understanding of the widening mechanisrn of the pharynx was provided by Laver (16) with his working model of hypo- and oropharyngeal physiology. He states that the contraction and expansion of the pharynx is heavily influenced by movements of the tongue and larynx. During the production of **the yawn, t**he larynx descends by action of various infralaryngeal muscles. The pharyngeal constrictors relax. When the larynx is fixed by the infrahyoid muscles, contraction of the paired stylopharyngeus muscles widens the pharynx laterally.

In this study, the larynx was observed to remain in the descended position after the yawn for the initial part of the sigh. As the sigh continued, there appeared to be a gradual ascent in most subjects. This laryngeal lowering and pharyngeal widening appeared to have a direct effect in lowering formants 2 and 3 of the seven subjects. The female subject who could not yawn-sigh displayed no changes in her formant frequencies. There appeared to be a slight gap between the approximated vocal folds in their total length under the sigh condition, perhaps contributing to a perceived breathiness with a resulting increased perturbation level.

Does the same desirability for holding the larynx in a lower position for singing hold for the speaking vowe as well ? The vertical positioning of the larynx has been found to vary up to 30

mm above or below resting levels in studying untrained singers producing extremes of low to high pitches. The trained singer keeps the larynx in a lowered position, regardless of frequency or intensity demands, with only minimal vertical excursion (17,18). With either singing or speaking, laryngeal elevation decreases vocal tract length (producing a smaller pharyngeal resonating cavity for higher frequencies), often compromises supraglottal resonators, and increases the adductory force of the vocal folds.

Perhaps for the normal speaker free of voice problems, the vertical excursions of the larynx accompanying upward and downward pitch inflections are perfectly natural and should not be discouraged. For the voice patient with a problem. of vocal hyperfunction, however, there may be dramatic gains from producing a more relaxed voice with a lower-positioned larynx and an open pharynx. Under these conditions, there appears to be less "pressed" or "tight" phonation. As observed in seven subjects in this study, phonation appeared to be produced with a slight glottal opening, the opposite of excessive vocal fold compression.

It would appear that some patients with vocal hyperfunction experience horizontal-vertical pulling tensions of the larynx from many sources: the anterior movements of the tongue, the upward pull of the hyoid, the severe compression of the thyroarytenoids within the larynx, and the downward tug from infralaryngeal muscles. In studying the intrinsic pitch of vowels, Sapir (19) has developed a horizontal-vertical pull hypothesis that details how tongue movements contribute to laryngealpharyngeal changes in both vertical and horizontal dimensions. Excessive posturing and movements of the speech articulators might well contribute to pathological voice production. Sapir writes, Treatment of laryngeal and phonatory dysfunctions may therefore involve reduction in articulatory muscle tension, modification of supralaryngeal articulatory posturing, reduction in vertical laryngeal movements.

The yawn-sigh approach, when modeled first by the clinician, can be performed by most patients with relative ease. The lowering of the larynx and the widening of the pharynx seem to contribute to a more relaxed phonation, characterized by a slight increase in breathiness (usually the result of a lessening of glottal tension), a slight elevation of jitter, and a lowering of formants 2 and 3. The selfanalysis of the speaker (and by his or lier listeners) is usually that the voice produced on the sigh feels and sounds relaxed.

It would appear that there are several ways that the yawn-sigh can be employed in voice therapy. An obvious way is to use the sighed voice for the production of a relaxed voice. For the patient with severe problems of vocal hyperfunction, the sighed voice may be his or lier first attempt at producingféeling-hearing a relaxed voice. The feeling and the sound of the production should be reviewed by clinician and patient. Another useful way of using the yawn-sigh is to extend the sigh with monosyllabic words beginning with /h/. The patient is instructed to maintain the lowered larynx and relaxed sound with a series of /h/ words with middle and back vowels. With a little practice, phrases and sentences can be said on the sigh. Patients can often monitor the lowered laryngeal position by placing their fingers gently on the thyroid cartilage. If laryngeal elevation is felt, they are told to go back to the sigh (which will lower the larynx) and then continue. An extension of the method into conversational voicing should produce only a minimal elevation of the larynx, primarily on high front vowels.

A more recent use of the yawn-sigh by this author (11) is using the method situationally with normal speakers who at times experience a tense voice. In a tense situation, the individual is

told to produce an invisible or "silent" yawn-sigh. This is produced by yawning with one's mouth closed, followed by a mouth-closed sigh. Only a slight nostril flaring in some subjects is visible. The patient benefits from the lowered larynx and dilated pharynx produced by the sigh, usually producing a relaxed phonation.

CONCLUSION

The yawn-sigh appears to be a useful voice therapy technique for lowering the position of the larynx, widening the supraglottal airway, and producing a more relaxed voice. Under the sigh condition (after the yawn), seven of eight normal subjects lowered the larynx, retracted and elevated the longue, experienced some pharyngeal widening, and produced a more breathy voice (with lowered formants 2 and 3). The yawn-sigh is a useful technique for countering tense supraglottal postures in patients with vocal hyperfunction. Several applications of the technique for use in voice therapy were presented.

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