

AN ALTERNATIVE APPROACH TO THE TREATMENT OF VOCAL FOLD NODULES
IN CHILDREN - A CASE STUDY

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ABSTRACT - A six year old child with long-standing bilateral vocal fold nodules and dysphonic voice received five lessons in skillful yelling or "belting". Laryngoscopy findings, post-treatment, confirmed the resolution of the nodules. Spectrographic analysis, pre- and post-therapy confirmed the successful resolution of the dysphonia. He was not discouraged from yelling.

INTRODUCTION

Billy was six and a half when he was referred for treatment of his small bilateral vocal fold nodules by his ENT Surgeon. He had a moderately severe neurosensory hearing loss unilaterally and an associated speech and language development disorder. His speech pathologist was currently overseas so he wasn't receiving speech and language therapy at this time. Prior to this he had received six months of speech and language therapy but no work on his voice other than advice to his mother to try to curb his yelling.

This was very much the pattern of life in Billy's family. It was not surprising that he yelled. Everyone yelled at home so it was very noisy, so with his expressive language problems, hearing loss, competitive nature and the model set by his parents, he sure yelled.

BELTING

As one of the only two chartered practitioners of the Estill Model I have had considerable experience in teaching "safe yelling" or "belting" to auctioneers, school teachers and others who must be loud but not traumatise their vocal folds in the process. Jo Estill's work on belting allows us to learn how to do it and then teach it. Belting is the high intensity voicing most commonly heard in Broadway musicals at the top of the range of tenors and typified by the voice of Ethel Merman. It is my experience from yelling with live-stock auctioneers for three hours at a stretch and the experience of those that I have taught, that it does not produce any vocal trauma as long as it is done well. So it occurred to me that Billy could benefit from learning to yell well, ie. to belt.

A REVIEW OF THE LITERATURE

Before I took this intrepid step I decided to review the literature on the treatment of nodules and whether there could be justification for my notion. I looked at the work of Greene, Aronson, Boone and several others.

In summary, they said that loud voice use was always responsible for nodules and that such loud voice use is a sign of personality disorder and that all loud voice use is hazardous to the vocal folds.

Traditional treatment was seen as voice rest, eradication of all loud voice use and sometimes attention to vocal technique, principally breathing and relaxation. The parents are, therefore, forced to impose restrictions on their own and their child's voicing.

Treatment was costly as it often spanned years and was not always successful. There was never any reference to the perceived nature of the voice after treatment.

LARYNGEAL CONSTRICTION

This saga of events depicted in the literature gave rise to some concerns. If the literature was correct that all loud voice use is hazardous to the larynx, why weren't Billy's parents dysphonic? Was Billy's frustration in the speaking situation causing him to yell in a way that traumatised the folds? Certainly his mother referred to his yelling as sounding like "rasping".

Ventricular fold activity

Here is some video data of constricted voicing showing the ventricular fold activity that occurs when someone struggles to voice. The fact that ventricular fold activity is an abuse of the mechanism is well accepted. Was this what Billy was doing? It certainly sounds raspy - rather like the efforts of some popular rock stars whom I wouldn't dare to name.

LARYNGEAL CONSTRICTION RELEASED

Here on the other hand is a view of belting - the larynx free of constriction.

THE INFLUENCE OF THE FAMILY

Another major concern was the effect on the family of asking them to change their vocal habits to become quiet. Schank and Abelson in 1977 in their book "Scripts, Plans, Goals and Understanding" draws our attention to the fact that our behaviour is governed by unconscious motivation that stems from a script hidden from an individual's conscious self. In other words, most understanding

is script-based. Considering this family's "script" it wasn't surprising that his mother resisted the notion of quietening Billy and warmed to the notion of teaching him to yell well.

WHY BELTING?

So, the case for belting began to take shape and there now seemed at least three good reasons to teach him how to do it, ie. neither he nor his family would have to be quiet, performers who belt well without constriction don't experience trauma and what's more, it's easy to learn. Even I, a speech pathologist, can do it.

CASE DESCRIPTION

Now to give you some details of Billy.

Billy had been slow to thrive as an infant due to perinatal jaundice. His motor milestones were within normal limits but his speech had been slow to develop. His mother had suspected a hearing loss, but none had been detected on audiometric assessment until he was four and a half. He was fitted with a hearing aid at age five. Billy had a brother aged nine and a half who had a more serious developmental speech and language delay; a sister aged seven years, seven months with normal speech and language development; and a sister aged two years and two months. Billy and his older brother were frequently in competition, although the competitiveness when described by their mother was mostly on Billy's part. The mother described the home as a noisy one. The parents and all the children yelled and there was much sibling rivalry.

Speech and language therapy

At the age of four years and nine months he began speech and language therapy. His test results showing a marked receptive language difficulty which improved over the six months of therapy from 4:9 - 5:5; he had an expressive loss of similar magnitude which also improved. He had some minor articulation problems.

School progress

His school progress was slow, especially with literacy and his distractible nature earned him the tag of the "class clown".

Voice analysis - pre-therapy

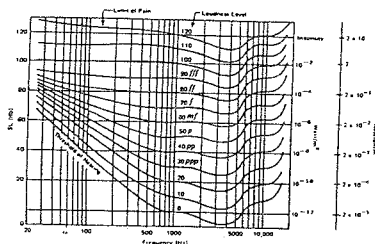
His speaking voice was hoarse and produced with effort presumably as Greene discusses, due to the fact that the nodules on the vocal fold margins prevent full adduction of the vocal folds. Here is a small segment of his pre-voice therapy audiotape.

TEACHING BELTING

His therapy sessions with me took the form of lessons in belting. Belting requires the differentiated control of seven specific parameters of the vocal tract.

In brief, the vocal tract is small, the vocal folds massed and the aryepiglottic sphincter closed. The acoustic features of belting are very high sound pressure levels, the band width is very wide, there is intense energy in the higher partials and perceptually it is very loud and brassy.

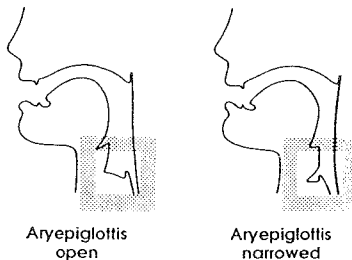
This acoustic energy in the higher partials is what gives it the perception of loudness. Fletcher and Munson demonstrated in 1933 with their curves of equal loudness that the human ear is more sensitive to higher frequency sounds than to low ones. Therefore, a low note requires far greater intensity to reach threshold than does a high note. A tone with energy in these higher partials will always be perceived as loud. We all know how we react to the piercing high pitched wails of the infant and conversely how many singers seem to "die" as they descend the scale.



(Curves of equal loudness - Fletcher & Munson 1933)

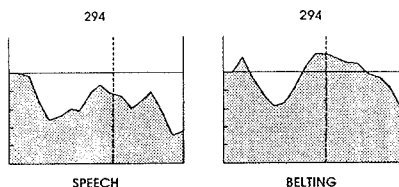
This acoustic energy is due to the narrowing of the aryepiglottis.

In this video clip, looking from above, note the narrowing of the aryepiglottis, and anterior-posterior narrowing corresponding with the increase in intensity of the vocal note. Notice the lack of constriction. At the level of the glottis, the ventricular folds are open.

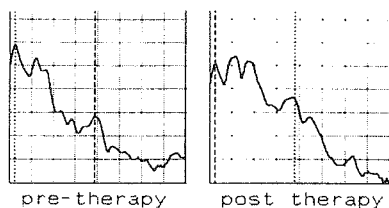


SPECTRA OF SPEECH AND BELTING

These spectra of speech and belting show the relative high energy peak in belting. The dashed vertical line at 3 KHz is precisely at the area of the spectrum to which the ear is most sensitive. Note the relative reduction in the height of that peak in speech compared to that in belting.



THE SPECTRA OF BILLY'S SPEAKING VOICE PRE- AND POST-THERAPY



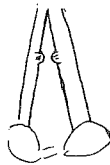
These power spectra are of Billy's speaking voice pre and post therapy. They are isolated from spontaneous speech recordings made at his first and last session and are of the vowel "er" both at 280 Hz. He used this vowel frequently while thinking what he was about to say. Pre-therapy, on the left, shows a steep fall-off of acoustic energy after the first harmonic with a tiny peak at 3.8 KHz. Notice also the noise component continuing well above 8 KHz. The post-therapy power spectrum, shows far greater energy in the higher harmonics with a much larger peak at 3.8 KHz. The interesting finding was that Billy's conversational voice had become energized in the higher frequencies and even more interesting that over the five treatment sessions, yes five, the roughness and hoarseness had disappeared. Notice how all noise in the signal disappears at 8 KHz. The spectrographic representation of hoarseness would seem to be a matter of some debate, although there is some agreement concerning the relative amount of noise in the signal, however, this may be calculated as signal to noise ratio, harmonic to noise ratio, relative harmonic intensity, normalised noise energy or the energy of the noise component compared with the total acoustic energy of the voice, as discussed by Sasaki, Okamura and Yumoto in 1991. For the purposes of this analysis, high frequency noise in the signal was used as a representation of hoarseness.

Voice analysis - post-therapy

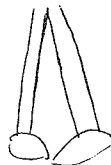
Here is a recording of his conversational voice at his last treatment session, ie. treatment session number five, somewhat denasal due to a heavy head cold, but predominantly free of dysphonia.

Follow-up

One month after conclusion of voice therapy, he revisited his ENT Surgeon who found no evidence of nodules. Line drawings made by his ENT Surgeon at the time of referral and at this post therapy visit show the complete resolution of the nodules.



pre therapy



post therapy

Seven months following voice therapy his voice was still clear of all roughness. He was still yelling at school, on the football field and at home.

CONCLUSION

In conclusion, in contrast with traditional voice therapy, his yelling was encouraged. He was taught to yell well. There were no vocal restrictions imposed on the family. His nodules resolved in five treatment sessions - five sessions as opposed to a range of 24 - 58 as described in the literature. His voice therapy was concluded in three months.

Perhaps in light of the fact that his loud voice use became efficient, we as speech pathologists should examine the rationale for eradicating loud voice use from the repertoire of young children. A comprehensive study with a statistically significant number of subjects and a control group will be needed to authenticate these results. To date, six other children have been treated similarly and all have progressed well.

ACKNOWLEDGEMENTS

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