

Treatment of Voice Hyperfunction in the Pre-Adolescent

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Children with hyperfunctional voice disorders represent a large portion of the voice caseload for speech-language pathologists working in the schools. The referral for the evaluation and management of children with hyperfunctional voice disorders may come from a variety of sources, including the teacher, family, school nurse, or family physician. Frequently, the presenting symptoms include dysphonia (hoarse, breathy, or rough voice), intermittent aphonia, voice and pitch breaks, excessively loud voice, and effortful or strained voice.

DIAGNOSIS AND ETIOLOGY

In every case, the etiology of the disorder must be determined, whether functional, organic, psychosocial, or a combination of these factors. Indeed, treatment planning begins with a definitive clarification of the physical status of the vocal folds made by an otolaryngologist during an indirect mirror examination, video-endoscopic recording, or, in extreme cases where the larynx cannot be visualized

ABSTRACT: Children with hyperfunctional voice disorders may respond readily to behavioral voice therapy based on education, voice conservation strategies, direct vocal function exercises, family and peer support, and relaxation. Treatment programs may take a variety of forms, but always rely on the successful integration of healthy respiration, phonation, and vocal tract resonance to achieve improved phonatory quality without vocal strain. Young clients are remarkably adept at recognizing and modifying maladaptive or abusive voice patterns, especially when combined with well-monitored diary charting and reward systems.

KEY WORDS: voice, hyperfunction, treatment, preadolescent, children

using office techniques, under direct examination in the operating room. The physical effects of hyperfunctional voice use (e.g., mass lesions such as nodules and polyps) must be identified so that appropriate treatment can be selected.

The school speech-language pathologist often becomes the primary advocate for the child's laryngeal examination. The justification for persistence in this recommendation is straightforward. Occasionally, dysphonia in a child may seem consistent with a hyperfunctional disorder, but in fact be a perceptual representation of other organic pathology (e.g., papillomatosis, submucosal cysts, gastrointestinal reflux, etc.). Medical, rather than behavioral, treatment is needed for these pathologies.

There is also need to "suspect" a correct diagnosis whenever the child's vocal behaviors and verbal affect do not match the profile of "hyperfunction." One unusual case described by a clinician found that a child with presumed nodules actually had suffered a fractured larynx during an incident of stranger abuse. Because the child's speech affect was very reticent, very quiet, and withdrawn, the clinician was alerted to the mismatch between typical hyperfunctional voice activity and her client's vocal behaviors (D.B. Lowery, personal communication, May, 1988). Thus, a firm prerequisite for all children with presumed hyperfunctional voice disorders is to receive an otolaryngologist's medical diagnosis prior to referral for speech services.

Beyond the laryngeal examination, a complete inventory of other health history must also be considered before treatment planning. If the child has frequent upper respiratory infections, including colds, sinus or tonsillar infections, congestion, post nasal drip, asthma, or allergies, these factors will influence the success of behavioral therapy on the voice disorder. In fact, combination (medical and behavioral) therapies may best serve children who demonstrate these related medical problems.

Voice use history provides the basis for the behavioral management of voice habits. For most hyperfunctional voice users, a classic profile emerges: talking too long, too

loud, and with too much effort. Information concerning the level of background noise in the household can clarify the level of "communication competition" the child may be experiencing at home. In families with loud voice habits (e.g., yelling around the house or outside, calling from room to room) and environmental background noise (e.g., television, radio, or other appliance noise), a child may adopt hyperfunctional voice habits merely to get the message across. In some cases, entire families may need to modify specific vocal behaviors, general communication style, and the overall level of background noise to support the child's voice therapy program.

Finally, the emotional history of the child must be explored with parents, teachers, and/or other caregivers who know the child well. The relationship between voice and psychosocial health has been well-established in adult populations (Aronson, 1985), and the feelings, attitudes, and stresses demonstrated in children may also affect vocal behaviors. Special attention should be given to children with affective disorders, including attention deficit disorder, hyperactivity, chronic and explosive anger fits, or general restlessness and nervous behaviors. For these special cases, interdisciplinary teamwork with the school psychologist or counseling social worker can assist in correct treatment targets, possibly combined with pharmaceutical treatment, counseling, and behavioral treatment regimens.

It is important to recognize that voice rehabilitation therapy with young children may not be successful when the hyperfunctional voice patterns are secondary to other behavioral problems. Young clients may have difficulty comprehending and complying with treatment tasks when other behavioral problems (e.g., attention deficit disorder) are not under control. Initial management of any primary behavioral disorder will facilitate the success of the voice rehabilitation program.

TREATMENT PROGRAM

Education

The treatment program begins by educating the client and family concerning the nature of the voice problem, including the etiology and maintaining factors. The specific activities that will be required for remediation, including voice conservation, direct vocal exercises, and principles of behavior modification must be introduced. Education also includes an explanation of the normal anatomy and physiology of the larynx, described at whatever level of complexity is appropriate. Then, the physical details of the client's specific laryngeal pathology should be explained in order to help the client and parents to understand the impact of the physical status of the vocal folds on voice quality, endurance, and range, and to appreciate the exact physical changes that are sought with therapy.

If actual images (e.g., video-endoscopic recording) of the client's larynx are available, this visual evidence can be extremely helpful in conveying information concerning the effects of the pathology on the anatomy and physiol-

ogy of the vocal folds, including adduction and abduction; fluctuations in pitch, loudness, and tension; and vegetative maneuvers, such as coughing, throat clearing, laughing, and crying.

If visualization of the client's larynx is not available, a sample demonstration tape can be used to help illustrate normal laryngeal appearance and function, contrasted with a sample of a representative child's larynx that displays excessive tension or mass lesions associated with hyperfunctional voice behaviors. If no video images are available, pictures or drawings can be used to display laryngeal structure and patterns of vocal fold activity during normal phonation, as contrasted with hypertensive vocalizations.

Children can also learn about the physiology of voice production, including respiration, phonation, and resonance through the vocal tract. To recognize the concept of diaphragmatic breath support, the child can feel his or her abdomen move in and out with quiet breathing. To help the child feel the consistency of this breath pattern in all positions, this activity should be done while sitting, lying down, and standing.

Once stabilized, the child can use appropriate breath support (not breathy voice!) with good laryngeal vibration. The goal is to produce the highest quality phonation in a relaxed manner. The child can learn to find the level of the thyroid notch, checking that it does not rise excessively during gentle humming (e.g., "hmmm, umm humm..."). He or she can also palpate the neck, or observe in a mirror to check for extrinsic laryngeal muscle tension. The greater the child's awareness of the components of excessive laryngeal tension and voice, the greater opportunity for the young client to identify small points to change, all of which lead to a better prognosis for improvement.

Finally, the child must learn the concept of vocal tract resonance. This can be demonstrated fairly readily by having the child imitate the clinician's models of "chest" voice, "nasal" voice, "head" voice, and posterior- and forward-focused oral resonance samples. As these different resonance alternatives are demonstrated, it is important to hold pitch and loudness fairly stable so that the child can appreciate the relationship between vocal tract shaping (especially oral opening and tongue position) and the sound of the voice produced.

Resonance training is especially critical during the end-stage of treatment, when children with hyperfunctional voice disorders can be trained to use louder phonation by "projecting" voice effectively, rather than straining in a vocally abusive pattern. This louder voice can be used safely (if judiciously) for emergencies, team sports, and other activities that require "calling" out (to teammates, to pets, etc.).

Educating the child regarding the anatomy and physiology of normal laryngeal function, providing specifics about his or her pathology, and encouraging recognition of the "building blocks" of voice production (respiration, phonation, and resonance) set the scene for successful behavioral voice therapy. These concepts are stressed continually in treatment as the child learns to maximize his or her best performance in each area to coordinate a healthy, non-abusive voice production pattern.

Voice Conservation

Hyperfunctional voice disorders almost always result from some form of vocal abuse or misuse. To allow for physical recovery of the vocal folds and for the return of normal phonation, these specific behaviors must be identified and reduced or eliminated. A handout describing the range of possible vocally abusive habits can be used to inventory those that the child or parents may recognize as troublesome or typical. It is useful to divide the inventory into three sections that are consistent with the etiologic components discussed previously: medical/organic, voice use and demands, and psychosocial or emotional. Following are partial lists of considerations for each division.

Medical/Organic

- amount of water consumed daily
- amount of caffeinated drinks consumed daily
- interaction of any chronic illnesses with voice production (e.g., respiratory infections)
- all current medications

Children may increase the rate and success of vocal recovery when they are well-hydrated. Caffeine serves as a diuretic, pulling fluid from the body, and may exacerbate already hyperfunctional behaviors or hyperactivity in children. The clinician must also be aware of the possible effects of medications on voice production (Martin, 1988).

Voice Use and Demands

- vocally abusive non-speech habits, including coughing, throat clearing, loud crying, or grunting
- vocally abusive speech patterns, including loud voice, screaming or yelling, tantrum behaviors, talking over background noise, other excessively strained voice productions, “funny” voices associated with play time or pretend characters, or singing loudly to music
- persistent voice breaks and glottal fry (though perhaps dictated by deteriorated physical status of the vocal folds) are also perceptual indicators of poor breath support and reduced oral resonance
- talking too long, without allowing an opportunity for “recovery” (quiet) time, very social and verbal personalities (described affectionately by parents as “motormouths”)
- sharp glottal attacks or voice onsets are a clear signal of excessive tension in the larynx and increased phonatory effort

Identification and recognition of these voice habits may take time. Often, a child or parent will deny certain maladaptive behaviors during the first interview, but on a follow-up appointment, may have new awareness of the greater frequency of the behavior, simply from having recognized its potential impact on voice production.

Psychosocial or Emotional

- excessive stress or tension in the child’s life, associated with difficult issues at home, school, with family or friends; recent changes such as divorce, death, moving, family experience, or illness
- inappropriate or unresolved coping mechanisms for negative emotions, including anger, fear, sadness, and nervousness, resulting in “bottled up” anger or high-strung and explosive personality outbursts, mood swings, or irrational behaviors

These situations may provoke stress that is manifested as hyperfunctional voice use. Children can relate to the close connection between voice and emotions because they are familiar with the idea that sad events make them cry, happy events make them laugh, and, if they are nervous or upset, the voice may become shaky or quiet. Clearly, interdisciplinary consultation with a counseling professional is warranted whenever extreme manifestations of emotional upset are demonstrated or reported in a child. Voice therapy programs may work best when coordinated with other psychosocial treatment in those cases.

Voice Therapy

In addition to education and voice conservation strategies, the reduction of hyperfunctional voice use requires active intervention to establish a new, healthy phonatory pattern. Simple voice exercises, usually conducted morning and evening as a voice “warm-up” and “cool-down” routine, help establish this new motor pattern. Keeping exercises short (e.g., maximum 15 minutes), but practiced twice daily, may enhance the compliance of young clients in maintaining a consistent vocal exercise regimen.

Direct vocal function exercises may take a variety of forms (some will be described below), but all should target appropriate breath support, voicing, and resonance. It can be confusing for young children to face all three components simultaneously. Sometimes, a sequential cue is useful, as follows: “Take a good breath, relax your voice, and open your mouth to say (target word or phrase).” Soon, children recognize their own abilities to improve voice quality by using adequate breath support, reaching for “clearer” tone, and opening their mouths for better oral resonance during speech.

A simple adage can assist their efforts to self-monitor vocal behaviors: “If your voice sounds good, you’re using it in a healthy way.” Given this concept, children can learn to listen for (and demand from themselves) the best possible sound of voice they can produce. In this manner, they are always attending to quality and looking toward good speech production habits.

There are, of course, many traditional voice therapy techniques that have wide application to children with hyperfunctional voice disorders, including classic techniques of yawn-sign, chewing, quieter voice productions, and modified voice rest. However, the three alternatives

mentioned below are direct vocal function exercises specifically designed for the coordination of respiration, phonation, and resonance as a three-part system of healthy voice use.

1. Easy onset of voice plus resonant tone. Children can be made aware of their sharp glottal attack or tense voice onset by feeling the difference between rapid, forced vowel onset in words and the slower, more relaxed voice onset produced in an /h/ + vowel sequence. By touching his or her thyroid cartilage, the child can sense the timing and relative force of vibratory onset in the two contrasting productions.

It is important that the /h/ onset be accompanied by the production of a clear and resonant (frontal focus) tone, beginning with sustained vowel sighs (e.g., /ha::, hi::, hu::, ho::/, etc. In order to avoid breathy phonation, it is important to pair gentle onset with good, resonant tone. Successive approximation of easy onset plus resonant phonation in words, phrases, sentences, and general conversation can help to relax the mechanism and improve phonation. When children with hyperfunctional voice disorders are ready to learn voice projection techniques, this easy onset plus resonant tone pattern may serve as a model for coordinating breath support, slower voice onset time, and clear tone with increased loudness (Andrews, 1991).

2. Accent method of phonation. This technique requires the coordination of respiratory support and phonation in specific accented rhythms and patterns. Respiratory “pulses” create rhythmic phonation in a train using varying voiced fricatives, nasals, and liquids, including /z, v, ʒ, m, n, w, r, j/. The rhythms of these carrier pulses (accents) increase in complexity and rate, from two or three slower beats to five or more accented beats per train. Three patterns are used:

1. Largo (2/4 time): /wa ‘wa ‘wa:/
2. Andante (3/4 time): /wa ‘wa ‘wa ‘wa:/
3. Allegro (4/4 time; double speed): /wa wa wa wa wa wa wa ‘wa:/

Under each condition, it is important to maintain a very relaxed jaw and larynx, and allow the diaphragmatic breath pulses to “drive” the rhythm of productions. At first, it may be useful for the child to lie down with a hand on the abdomen to feel the diaphragmatic pulses as he or she vocalizes. Once the patterns are stabilized, the child can move to sitting or standing positions to continue the exercises. The method has been described by Smith and Thyme (1978) and Koschkee (1993) and has been applied with success to children with hyperfunctional voicing patterns (B. Fex, personal communication, June, 1988). Its utility is especially appropriate in clients who have difficulty sensing the connection between respiratory control and phonation.

3. Physiologic voice therapy. Stemple (1993) has developed a series of physiologic vocal function exercises that purport to enhance the tone and coordination of vocal fold vibration. The technique demands that clients sustain a vowel /o/ tone in a comfortable pitch as long as possible and as quietly as possible, using maximal diaphragmatic breath support. A series of eight sustained vowel tasks is conducted twice daily, as has been described by Stemple

(1993). The emphasis is on increasing both the quality and duration of the vocal tones at the very minimum loudness level possible. This technique has great application for clients who have difficulty achieving a sense of oral resonance during voice production.

Relaxation Techniques

Children can also learn to apply general relaxation principles, especially in the head and neck region, to help reduce muscular and emotional tension when they encounter a stressful or angry situation. Simple stretches of the neck and chin, comfortable head rolls (from shoulder to shoulder in the forward position only), and arm rotations are fun and simple to use and create a looser, more relaxed upper neck musculature for speakers with hyperfunctional voice disorders.

Suggestions of relaxed voice can also be used with children to give them associations of a comfortable, unstressed feeling when they are speaking. Simple word cues may facilitate a reduction in effort and strain of voice production. Examples include “gentle,” “easy,” and “flowing” voice. Contrasting relaxed vocal postures with very brief samples of negative practice using “tight,” “tense,” “hard,” “strained,” “choking” voice may help the child feel dramatic differences in laryngeal tension during voice production.

Role of Family, Teachers, and Friends

Because voice therapy relies on home programming for carryover to the child’s real world, the compliance and motivation of parents and other family members is critical to the success of treatment. This also applies to the child’s schoolteachers, who can support the child’s efforts to maintain good vocal habits in the classroom and playground setting.

Often, the inclusion of parents, siblings, teachers, and even close friends as “allies” in the client’s voice rehabilitation program is a key factor in garnering adequate support for the child when he or she leaves the therapy setting. Without this support, the child may feel alone in the effort, and occasionally face teasing or ridicule because of a need to conduct voice exercises or restrict voice use. Many young clients have described the unfair advantage of a sibling who “gets to yell and doesn’t get into trouble.” To derail this problem, it is helpful to foster positive support for good voice use from peers and siblings, as well as from adult caregivers.

Another critical distinction for parents and teachers is to keep comments and constructive recommendations to the child about his or her voice use separate from other household or classroom responsibilities. Parents need to avoid the trap where the child is reprimanded for incorrect voice use in a manner similar to reprimands for other infractions such as forgetting to make a bed, and so forth. The role of parents, siblings, peers, and teachers in the clinical process must remain supportive and upbeat, as “champions” of the child and his or her efforts to improve vocal function.

Journal and Reward System

Success of the treatment program depends on the commitment of the client to augment changes made during therapy sessions with carryover or correct voice use into general conversation. To improve the rate of transfer and carryover, young children with hyperfunctional voice disorders should be rewarded for the serious work (and it is!) they put forth to correct abusive vocal behaviors. A hard-copy self-monitoring (with parental assistance) system may take two forms:

1. Daily charting of specific behaviors, such as:
 - a. amount consumed of water, caffeine, and other beverages;
 - b. number and time lapse of vocal abuse behaviors, including yelling, tantrums, loud crying, and talking over noise;
 - c. number and time spent on morning and afternoon vocal exercises; and
 - d. number and time lapse of quiet "recovery" time (complete vocal rest) following loud or prolonged voice use.
2. Daily journal to summarize impressions of overall vocal performance for the day. This technique is especially helpful for older children who can write. Through daily journals, they can express their recognition of both positive and negative factors, problems areas, and questions and concerns regarding voice use. Typically, a child may report that the day went well, except for loud playground activities during recess, or during an argument with siblings at home.

These charting formats not only assist the clinician in assessing the level of compliance with therapy, they also serve several useful purposes for the child. First, they enable the child to identify and track specific behaviors to be altered or eliminated (and these may be varied each week, per need). Second, they allow the child some level of "ownership" or control over the assessment and reporting of his or her own efforts to improve his or her voice. Finally, if work is moving in a positive direction, they afford both parents and the clinician the opportunity to provide a concrete tangible reward (preestablished by parents and client together) for good work in voice rehabilitation.

Occasionally, a problem will arise in which there is disagreement between the child and the parents concerning the level of compliance reported during the week. In such cases, both the parents and the child may fill out separate daily charts of the child's voice activity. Through separate charting, they can learn to work together toward agreement. Usually, this means a bit more "reality orientation" for the child, who must recognize the number of vocally abusive activities, for example. Once the newly established patterns of voice conservation, use of voice exercises, and awareness of voice use become more routine, charting becomes less important. The "reward" is more intrinsic for the child, who may be happy to have recovered his or her voice, or pleased that he or she can move to a new, healthy activity of louder voice projection without vocal strain.

Instrumentation

School clinic settings do not always have access to advanced vocal function analysis equipment, such as videostroboscopy, acoustic analysis, and aerodynamic measurements. Certainly, if these measurement capabilities are available, they can be used to good advantage with children. However, even simpler instruments, such as sound level meters, pitch meters, and tape recorders can be used effectively as documentation, monitoring, and biofeedback tools for children with hyperfunctional voice disorders.

Because common targets in therapy are reduced loudness and increased vocal quality (e.g., decreased breathiness, roughness, or strain), the use of simple mechanical devices can still provide very useful and meaningful feedback for children who are learning to monitor their own vocal behaviors. Children often find it appealing to take an interest in and responsibility for achieving an objective number (e.g., appropriate decibel level during voicing, increased number of pitch steps in a vocal range), as opposed to global recommendations to "make voice clearer," which can become less meaningful with time.

SAMPLE CASE HISTORY

The following case describes a successful diagnosis and treatment experience for a child with a hyperfunctional voice disorder, and may serve to highlight some of the applications of principles described previously.

A 7-year-old girl was referred to a voice pathologist by an otolaryngologist, who had diagnosed "soft, moderate-sized" bilateral vocal fold nodules. She had a 2-year history of chronic hoarseness and intermittent aphonia, without evidence of other speech or language problems.

Her mother described the child as active, energetic, and frequently "difficult," based on "temper tantrums" and episodes of yelling and screaming with her mother and 5-year-old brother. Her second-grade schoolwork was average, and she did not pose behavior problems at school. Her parents had divorced 2 years previously, and custody was shared jointly. The child, her mother, and her brother were being seen weekly in family counseling sessions to resolve problems with discipline and communication at home.

The child's medical history was negative. She drank milk with meals and approximately three cans of caffeinated soda per day. Little or no water was consumed on a regular basis.

The client received a standard battery of vocal function testing in the voice laboratory, including:

- videostroboscopic examination of the larynx to assess the vibratory pattern of the vocal folds and the size of the vocal fold nodules;
- acoustic analysis of sustained vowels and sentence productions to assess frequency, loudness, and perturbation in habitual and range tasks; and
- aerodynamic measures of airflow rate, volume, and intra-oral air pressure.

Following is a summary of relevant pretreatment measures.

Visual-perceptual measures: The stroboscopic recording revealed moderate-sized, bilateral vocal fold nodules at the anterior two-thirds junction of the vocal folds, with no evidence of edema or hemorrhage. Mucous stranding between the vocal nodules was persistent. The nodules appeared to vibrate with the vocal folds, although mucosal wave and amplitude of vibration were reduced at the midline bilaterally, presumably due to stiffness posed by the lesions. Phase symmetry and periodicity were irregular. Supraglottic hyperfunction was noted as a mild but consistent medial compression and “bulging” of the ventricular folds, and was evident throughout sustained vowel productions.

Acoustic analysis: The client’s mean fundamental frequency was 237 Hz, with a low to high range extending from 157 to 314 Hz, as measured by CSpeech (Milenkovic, 1987). Sustained /i/ produced mean jitter of .09 msec, shimmer of 6.7%, and a signal-to-noise ratio of 14 dB. All of these measures represented subnormal performance based on the expected acoustic measures for a child of this age and gender (Glaze, Bless, Milenkovic, & Susser, 1988). Intensity measures revealed that minimum (62 dB SPL), habitual (70 dB SPL), and maximum (87 dB SPL) loudness productions were all within the expected range for her age and gender (Glaze, Bless, & Susser, 1990).

Aerodynamic measures: Air flow measures were taken during sustained vowel productions and intra-oral pressure measures were estimated from repeated productions of /pi/. Mean air flow rate was 270 cc/second, which is considered excessive, suggesting “air leakage” through the laryngeal valving mechanism. Intra-oral pressure was measured at 8.3 cm H₂O, which is also greater than the expected norm of approximately 5.0 cm H₂O.

Audio-perceptual measures: Perceptual judgments of the client’s voice quality were made during informal conversation and sentence productions. At the initial evaluation, she exhibited moderate amounts of roughness and strain, a mild amount of breathiness, and no evidence of weakness. She also sang the song “Happy Birthday” to assess pitch changing ability during a familiar singing task, and demonstrated five pitch breaks. In conversation, she was intermittently aphonic for one-two syllables duration on an average of once each breath group. Her habitual loudness level was not excessive, nor did she exhibit signs of sharp glottal attack during casual conversation.

Based on the client’s history and evaluation findings, it seemed that the etiology and maintaining factors for her hyperfunctional voice problem were found in the following factors:

- acute vocally abusive behaviors;
- chronic, ongoing stress in the family setting; and
- possible dehydration due to moderate caffeine intake with minimal water.

Consequently, treatment goals targeted a reduction of specific vocally abusive behaviors and, in conjunction with the family counselor, support for continuing development of alternative behavioral management techniques that might reduce overall household tension and opportunities for

vocal abuse. Five treatment goals were established, organized within a therapy regimen focusing on client and family education, elimination of vocal abuse, and increased self-awareness and self-determination of voice productions.

Goal 1. The client, her mother, and her brother will learn about the origin and resolution of vocal nodules, the risks of additional vocal deterioration, and the effects of vocally abusive behaviors on vocal fold structure and function.

With children, client education concerning the vocal pathology can lead to motivation and a sense of responsibility and “ownership” toward the voice problem and the rehabilitative process. For this child, viewing the video-stroboscopy recordings of her larynx was particularly enlightening. Another example of vocal fold injury was simulated by having her and her brother clap their hands together for a 3-minute period, so that they could feel how tired and hot their hands were after clapping hard together for that time. From session to session, she was “quizzed” by the voice pathologist to ascertain her level of understanding of the pathology and the cause-effect relationship between voice behaviors and rehabilitation. She appeared to enjoy displaying her new breadth of knowledge each week.

Goal 2. The client and her mother will participate in a home program designed to reduce vocal abuse, and provide “recovery” time for each instance. They will monitor and record on a chart all instances of vocally abusive behaviors at home, including screaming, yelling, excessive crying, and “tantrum” behavior. For each instance of vocal abuse incurred at home, the client will conduct a 10-minute period of silent “recovery” time, to be spent in a relaxed, quiet activity of the client’s choosing. Each week, she and the voice pathologist will predetermine a target maximum of vocally abusive episodes. If, at the end of the week, she and her mother determine that the target goal has been met, a specific reward (pre-selected by the child and her mother) will be granted.

Home programming for the systematic reduction of vocal abuse allows the greatest potential for therapy success and generalization. Without home compliance, the prognosis for improvement with therapy is limited. A token system of charting vocal behaviors provides opportunities for increased awareness and recognition of abusive behaviors, motivation for reducing those instances (target maximum, reward), and, most importantly, a defined alternative response immediately post-abusive incident (recovery time). This recovery time is not meant to be punitive, but neutral; it serves as an extended reminder (10 *silent* minutes) of the incident, and stands as a signal that “damage” to the vocal folds must be met with a period of “recovery.”

In this child’s case, it was especially important that the family was able to distinctly separate her voice program responsibilities from other general household chores and disciplinary events. During the course of therapy, she displayed increasing adherence to the program, with successive reductions of vocal abuse incidents in five out of seven regular treatment sessions.

Goal 3. The client will eliminate all colas and caffeinated beverages from her diet, and drink a minimum of five eight-ounce glasses of water per day.

Evidence of mucous stranding and reports of the child's typical caffeine consumption raise questions concerning possible insufficient hydration of the vocal fold tissues. By increasing water intake and avoiding caffeine, she may be assured adequate hydration for voice production.

Goal 4. In conjunction with her family therapy, the client will keep a daily journal of pictures, drawings, or written material describing her voice use that day, based on feelings and events that created opportunities for positive or negative voice use.

The family counselor had already initiated a journal project with the child and her brother to encourage greater self-awareness of their feelings. With the counselor's permission, a voice use component was added to allow the client to relate everyday stress responses to her vocally abusive behaviors. She made schematic drawings of nodules in her throat, drew pictures for her room to remind her not to yell (e.g., picture of a lion "roaring" with a big X over the mouth), and wrote large signs to use instead of yelling (e.g., "LEAVE ME ALONE!").

Goal 5. The client will conduct vocal warm-up and cool-down exercises twice daily to assist with correct breath support, relaxed phonation during voicing, forward-focus oral resonance, and easy onset of phonation. Exercise tasks will include breathing, humming, use of /h/ + vowel syllables in long sighs, and /h/ initial words and phrases. Session duration will be approximately 7–10 minutes.

Results

The client received seven sessions of voice therapy over the course of 3 months, and attended two follow-up sessions, at 1- and 3-months post treatment. At the final session (approximately 6 months from initial diagnosis), post-therapy measures and judgments were obtained.

Visual-perceptual measures: The client's vocal fold nodules were eliminated, as seen in a posttreatment stroboscopic recording, and confirmed by the otolaryngologist based on repeated indirect mirror examinations. Under stroboscopic light, vibratory movement exhibited normal phase closure, with normal mucosal wave and amplitude, and no evidence of supraglottic hyperfunction. Phase symmetry and periodicity were still irregular.

Acoustic analysis: The client reduced jitter and shimmer, and increased signal-to-noise ratio and semitone range based on sustained vowel tasks, as measured previously. Post-test acoustic measures were grossly within the expected range of norms for the child's age and gender. Habitual pitch and loudness did not change.

Aerodynamic measures: Mean air flow rate decreased 120 cc/second from initial measures, for a final mean rate of 150 cc/second, which was within expected normal limits for this child. Mean intra-oral pressure was measured at 5.7

cm H₂O, which was less than initial measures and within expected limits.

Audio-perceptual measures: The client's voice quality improved markedly, as judged perceptually by the client, her mother, and the voice pathologist. She eliminated pitch breaks and intermittent aphonia and reduced the amount of breathiness, strain, and roughness in her voice. Conversational voice productions were perceptually normal overall, with only mild roughness and no evidence of breathiness, weakness, or strain. During singing of the song "Happy Birthday," she had no pitch breaks.

The positive outcome of this treatment plan is attributable to client and family compliance with the home programming effort. During the course of treatment, it was apparent that the client developed a sense of self-awareness and responsibility toward her voice problem. Thus, it appeared that her decisions concerning good voice use were motivated by self-determination and her own sense of personal satisfaction.

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