

"Dear Diary . . ." Body Monitoring Techniques for Singers



John Nix

Singing is an athletic artistic activity. Like a dancer, whose entire body is an instrument of expression, a professional singer uses his or her body to produce sounds that are not only aesthetically pleasing, but also powerful enough to fill an auditorium. The physical requirements necessary to excel as a singer are considerable. Performing a lengthy recital or operatic role demands endurance like that of a distance runner, who carefully meters out effort over a long time span. The constant awareness of one's body in activity while singing is much like the kinesthetic sense of a gymnast. Optimal, not maximal effort, like that found in the balanced freedom of a golfer's swing or the fine touch of a billiards player's shot, marks the technique of fine singers.

Like all athletes, a singer's performance quality is subject to variation. Many singers (and their teachers!) find the unpredictable

condition of their instrument to be a source of great frustration. Seemingly without warning, "the voice" refuses to cooperate, often at a most inopportune time. Then, mysteriously, it returns to normal, leaving only questions: What happened? What caused the variation in quality to occur? Why did "the voice" return to normal when it did? How can future short term changes be anticipated?

To answer these questions, an understanding of the anatomy, physiology, and acoustics of the human voice is needed. It is practically impossible for a singer to recognize the possible causes of a vocal problem if he or she does not possess a basic knowledge of vocal structure and function. Once the source of the difficulty has been determined, a course of action to address the cause and its symptoms can be planned. How a problem is dealt with depends on its nature. Some factors that cause performance variation are environmental (those that act on the singer from without), whereas others are internal (within the singer's body). Those factors that are internal can then be divided into two groups: those that are use related or functional (such as the amount of air pressure a singer uses in phonation), and those that are organic (such as how the singer's thyroid gland is functioning). How can singers learn to recognize which factors have an impact on their performance? Given an awareness of the operative factors, which ones can

they control? How can they learn to anticipate when short term quality changes may occur?

Because singing is an athletic activity, singers can profit from training methods used by athletes in other disciplines. One of the most beneficial tools serious athletes employ in evaluating their training is a diary. There are several types of athletic diaries, each of which can be adapted and applied to singing. Some are more specific and require more attention to maintain than others. The type of diary chosen depends in large part on the personality and needs of the athlete or singer.

The first type of diary commonly used by athletes is a journal of their training. In this format, athletes keep track of all workouts, noting exactly what was done, when and where they trained, whom they worked out with, and how they felt before, during, and after the training session. Progress can be monitored on an objective basis through such record keeping. By reviewing the diary entries, patterns of training which prove to be more rewarding can be identified and repeated. For a singer, this type of log could include vocalises and repertoire worked on; when, where, and how long the singer practiced; whom (if anyone) they rehearsed with; and comments on how they felt vocally before, during, and after practicing. Such comments might include brief notes about vocal range, agility, the amount of time needed to warm up, ease of

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production, which vowels were good or bad, bodily tension level, and vocal endurance.

A second form of diary commonly used by athletes includes the workout information detailed above and relates it to more specific information about the athlete's physical condition on that day. At a *consistent time* each morning *before rising*, the athlete takes his or her resting pulse and basal body temperature. A thermometer accurate to one tenth of one degree is required. After rising, but before ingesting any food, the athlete's body weight is determined. Medications taken during the day are also noted in the diary. This objective information is included in the daily log entry, along with brief comments about meals, the quantity and type of fluids drunk during the day, length and quality of sleep the previous evening, and any drastic schedule changes that may have occurred that day, such as changing time zones when traveling.

Including resting pulse, basal body temperature, weight, medications, diet, fluid intake, sleep information, and schedule changes in the diary takes a little more time each day—about 5 minutes. These 5 minutes, however, are well spent. Having this information available increases the sensitivity with which an athlete can monitor his or her body. An elevated pulse rate (one that is

five or more beats per minute above the athlete's average reading) frequently indicates the body is still mildly fatigued from the previous day. Knowing this, an athlete can then adjust his or her workout accordingly to avoid overtraining. An unusually elevated or depressed basal body temperature can be an indicator of infection. This early warning sign can help the athlete know when to get extra rest or seek medical attention, before a full-blown illness has the opportunity to set in. Abrupt weight changes can be a sign of illness or dehydration, again alerting the athlete to take preventive care. Information about medications, meals, fluid intake, sleep habits, and schedule changes can also help the athlete to avoid potential difficulties, or at least recognize some of the causes of an existing problem.

For singers, physical condition information is especially helpful in anticipating or understanding changes in vocal function. For example, it was stated above that short-term changes in basal body temperature may indicate an infection. However, long-term, consistently low basal body temperatures (97.2 F or below) can be a warning sign of hypothyroidism.¹ Given the complications that may arise from low thyroid function (PMS, fatigue, weight gain, anxiety, depression, poor mem-

ory or concentration, headaches, frequent infections, hoarseness, muffling of the voice, and a loss of vocal range^{2,3,4}), any singer with consistently low basal temperatures would be advised to seek a medical evaluation, before vocal problems arise. Sudden changes of body weight can have an adverse effect on vocal performance.⁵ Singers on diets should keep an eye on the rate at which their weight changes. The use of medications, especially aspirin, other analgesic/anti-inflammatory agents, and those that target the respiratory tract, should always be monitored very closely by singers and their physicians. The type of food a singer eats and the time it is eaten can have an impact on vocal quality. Foods that promote an abundant secretion of gastric juices (i.e., red meats and dairy products) should be eaten well before or after a performance and well before sleeping. Singers with a history of acid reflux should carefully note when and what they eat in the evening. Both the quantity and type of fluids consumed are important. Singers should especially observe when they consume liquids that contain alcohol or caffeine. For general health purposes, perhaps the easiest way for a singer to monitor hydration is to observe the color of his or her urine. Van Lawrence's advice to "pee pale" is a good rule of thumb. Adequate

¹Marilyn Shannon, "What Your Basal Temps Reveal About Thyroid Function," *CCL Family Foundations*, 21, no. 6 (1995): 6,11. Shannon reviews the findings of Dr. Broda O. Barnes and Dr. E. Denis Wilson regarding lowered basal body temperature and low thyroid function.

²*Ibid.*, p. 6.

³Robert Thayer Sataloff, "Hormones and the Voice," *The NATS Journal*, 50, no. 1 (1993): 43.

⁴Michael S. Benninger, "Medical Disorders in the Vocal Artist," in *Vocal Arts Medicine: The Care and Prevention of Professional Voice Disorders*, Michael S. Benninger, Barbara H. Jacobson, and Alex F. Johnson, eds. (New York: Thieme Medical Publishers, 1994): p. 203–204.

⁵Robert Thayer Sataloff, "The Professional Voice: Part I. Anatomy, Function, and General Health," *Journal of Voice*, 1, no. 1 (1987): 98.

⁶Katherine Verdolini-Marston, Ingo R. Titze, and David G. Druker, "Changes in Phonation Threshold Pressure with Induced Conditions of Hydration," *Journal of Voice*, 4, no. 2 (1990): 147–150. Phonation threshold pressures for high frequencies lowered when the experimental subjects were well hydrated. Pressures were also more consistent from trial to trial in the experiment when the subjects were well hydrated. This would seem to indicate that when singers are well hydrated, they are capable of performing difficult passages, such as singing high pitches at a low dynamic level, with greater consistency. Empirical evidence from the author's teaching studio supports this conclusion.

hydration is crucial when optimum vocal performance is desired.⁶ As with athletes, keeping track of sleep habits and schedule changes can be very useful in understanding changes in vocal function. Given the erratic nature of a professional singer's life, with rehearsals and performances at all hours, jet travel, and so forth, any means of tracking these factors' impact on performance is worthwhile. Some singers might want to list other information which they personally find relevant to their singing.

In the case of female athletes, a third type of diary can be kept. This diary retains all the elements mentioned previously, and adds menstrual-cycle charting. The fluctuations in hormone levels which cause the menstrual cycle have a significant effect on athletic performance in women, especially singing athletes.^{7,8} If a performer knows where she is in her cycle, she can also determine which hormones are more active in her body chemistry. Given an understanding of what each hormone does to her body, she may plan the day's training or practice session accordingly.

How does a performer go about accurately charting her menstrual

cycle? Data from specific body indicators should be gathered and recorded each day. Days on which menstruation occurs must be noted.⁹ Any information regarding an unusual discharge or cramping is also valuable.¹⁰ Basal body temperature must be taken in the manner described previously.¹¹ On days when there is no menstruation, the mucus of the reproductive tract should be briefly examined and described. This mucus can be gathered in two ways: either internally from the mouth of the cervix with a finger, or externally at the labia.¹² Any sexual activity that might influence the mucus observations (through the presence of seminal residue) should also be recorded.¹³ Finally, the degree of dilation of the cervix, its relative position, and resiliency to the touch should be marked down.¹⁴

How does gathering this information relate to helping a woman understand her cycle? To begin with, the onset of menstruation marks the end of one cycle and the beginning of another. Each cycle is regulated by the interaction of several hormones, especially estrogen and progesterone.¹⁵ When estrogen and progesterone concentration levels are at their lowest, menstruation oc-

curs. As menstruation ends, estrogen levels begin to rise.¹⁶ Within the cycle itself, basal body temperature records can be used to help establish when hormonal changes and ovulation occur. After ovulation, the ovarian follicle secretes progesterone. Due to the presence of this hormone, the basal body temperature rises an average of 0.4° Fahrenheit, and stays at this elevated level for several days.¹⁷ This temperature shift can clearly be seen if the temperatures are plotted on a graph. Such a change on her temperature graph would indicate to an athlete or singer that ovulation had occurred and progesterone levels were elevated. Rising and falling levels of estrogen affect changes in the quantity and quality of the mucus secreted by cells in the cervix. These mucosal signs can also be used to determine when ovulation occurs. The quantity of mucus increases as estrogen levels rise and ovulation nears; the mucus also becomes less tacky and more slippery in quality. One to two days before ovulation, estrogen levels begin to drop, and the quantity of mucus begins to decrease.¹⁸ The disappearance of the slippery-quality mucus indicates that estrogen levels are lowering and that ovulation has

⁷Jean Abitbol, Jean de Brux, Ginette Millot, Marie-Francoise Masson, Odile Languille Mimoun, Helene Pau, and Beatrice Abitbol, "Does a Hormonal Vocal Cord Cycle Exist in Women? Study of Vocal Premenstrual Syndrome in Voice Performers by Videostroboscopy-Glottography and Cytology on 38 Women," *Journal of Voice*, 3, no. 2 (1989): 161. Twenty-two of thirty-eight women studied exhibited hoarseness and increased vocal fatigue prior to menstruation.

⁸John Kennedy and Jose Caro, "Sex Hormones and Singers: Endocrine Effects on Voice," *NATS Journal*, 51, no. 2 (November/December 1994): 31-32.

⁹John Kippley and Shelia Kippley, *The Art of Natural Family Planning* (Cincinnati: Couple to Couple League, 1984): 92.

¹⁰*Ibid.*, 93.

¹¹*Ibid.*, 94.

¹²*Ibid.*, 100-103.

¹³*Ibid.*, 92, 95.

¹⁴*Ibid.*, 106-109.

¹⁵Clarissa Behr Davis and Michael Lee Davis, "The Effects of Premenstrual Syndrome (PMS) on the Female Singer," *Journal of Voice*, 7, no. 4 (1993): 337-338.

¹⁶Kippley, 85.

¹⁷*Ibid.*, 111.

¹⁸*Ibid.*, 97-98.

¹⁹*Ibid.*, 104.

²⁰*Ibid.*, 106-107.

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probably taken place.¹⁹ The cervix also changes during the cycle. As ovulation approaches, the cervix opens up, rises (becomes more difficult to reach), and its opening, the os, becomes softer. After ovulation, the cervix closes, lowers, and becomes drier and firmer to the touch.²⁰ Through daily record keeping, the three indicators of hormonal action and ovulation can be checked against each other, thus enabling the singer or athlete to determine with a high degree of precision when a particular hormone level is high or low.²¹ She can also determine when she is fertile and when she is not.

What do changes in estrogen and progesterone levels do to a singer's voice? When levels are at their lowest (immediately prior to menstruation), the permeability of the walls of the vocal-fold capillaries changes, causing fluid to build up in the vocal folds:

As estrogens decrease, the small blood vessels supplying the vocal cords become more leaky, causing fluid to accumulate in the cords. Additionally, native complex sugars, or polysaccharides, break down into smaller molecules in the vocal cords. These small molecules have an increased ability to bind water, leading to more water accumulation.²²

Blood supply to the folds also increases at this time. This is not due to the lack of estrogen or progesterone,

but to an increase in secretions by the thyroid gland.²³ An additional complication resulting from the increased blood supply and the changes in capillary wall permeability is a greater risk of submucosal vocal-fold hemorrhage.²⁴ Vocal fold changes are not limited to the time of menstruation, however; the outer layers of the vocal folds are subject to change throughout the cycle, depending on whether estrogen or progesterone is predominant. When estrogen levels are high (just prior to ovulation), the superficial epithelium may thicken; when progesterone is high (during the postovulatory or luteal phase), the intermediate layers (lamina propria) may undergo development.²⁵ The net result of all these hormonal changes is a short-term change in the vibratory characteristics of the vocal folds. To the ear, the singer's voice may sound breathy, hoarse, or weak. Range may also be affected.

Menstrual cycle charting can be particularly beneficial for women in their reproductive years who want or need to avoid taking birth control pills. Detailed menstrual cycle charting is part of a birth control method known as the Sympto-Thermal Method. *If used correctly*, it is an effective (equal or better than hormonal pills²⁶) nonchemical means of birth control. Because up to five percent of women started on birth control pills exhibit vocal range and/or

quality changes,^{27,28} singers concerned about this risk may wish to explore the Sympto-Thermal Method as an alternative.

In recent years, athletes and singers have used other less objective means of monitoring their bodies. Biofeedback, meditation, and yoga have helped many performers in sports and the arts understand their bodily responses in rest and activity. An increasing number of athletes and singers are turning to the principles of the Alexander Technique as a "means whereby" to enhanced kinesthetic awareness and sensory appreciation. It is this author's opinion that these methods should be used as a supplement to, not a replacement for, the specific types of body monitoring described earlier.

Body monitoring through the use of diaries is a means to many ends. For the athlete, diaries can assist in fine-tuning training and avoiding overtraining-related illnesses. For the singer, diaries can help explain some of the reasons behind short-term changes in quality and function. For female athletes and singers, menstrual-cycle charting can serve as a method of sophisticated hormonal monitoring and as part of a means of birth control. Whatever one's motivation may be, awareness of how one's body is functioning is essential to maximizing performance.

¹⁹Abitbol's study included cytological smears (taking cell samples) of the vocal fold epithelium of each subject in the study. In nine of the subjects, cytological smears of the cervical epithelium were taken at the same time vocal fold samples were taken. Abitbol's group found a "significant similarity between laryngeal and cervical smears" (p. 157). There are many implications to this similarity. In monitoring changes in her cervically-secreted mucus, it seems possible that a singer could also get an idea of parallel changes occurring in the mucosa of the vocal folds.

²⁰Kennedy and Caro, 32.

²¹Barbara M. Doscher, *The Functional Unity of the Singing Voice*, 2nd ed. (Metuchen, NJ: Scarecrow, 1994): 226.

²²Sataloff, "Hormones and the Voice," 43.

²³Benninger, 205–206.

²⁴Kippley, 14–19.

²⁵Sataloff, 43.

²⁶Kennedy and Caro, 32.

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John Nix, Tenor, holds a Master of Music Degree in Vocal Performance from The University of Colorado at Boulder, and has pursued additional coursework towards the DMA degree at Colorado. While at Colorado, he studied voice and vocal pedagogy with Barbara Doscher and the Alexander Technique with James Brody. He received a Bachelor of Music Degree in Vocal Performance from The University of Georgia and a Master of Music Degree in Arts Administration from The Florida State University. He was selected for the 1994 NATS Intern Program, where he worked with Thomas Houser and Barbara Honn. Mr. Nix has recently given master classes at Adams State College, Montana State University and Armstrong Atlantic University. His published articles have appeared in The NATS Journal, The New York Opera Newsletter, and The Opera Journal. He and his wife, Dr. Catherine Nix, a member of the voice faculty at Texas Tech University, frequently perform joint recitals. They live in Clovis, New Mexico, where Mr. Nix is serving a one year appointment as Instructor of Voice at Eastern New Mexico University.

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Errata

In the January/February issue of *Journal of Singing*, we did not fully attribute passages from *Zerbrecht, zerreiβt, ihr schnoden Bande*, W. F. Bach, mm 11-16 and mm 54-58 reproduced on page 27 in Laurie S. Shelton's article. The correct attribution is: Tischer and Jagenberg, München, Germany, reprinted with permission of R. Grieshaber, GVS Glonner Verlags-Service.