Anatomy of the Voice

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Most people donâ€™t really take any time to consider the interesting work that goes on in the body when they sing. They seem to assume that the voice just magically â€œappearsâ€• whenever they will it to.

Nearly everyone has probably heard expressions like â€œsing from the diaphragm (or belly)â€• and â€œsu the breath (or voice)â€•, used frequently by many singing teachers. However, if a student doesnâ€™t understand some basic human anatomy that is related to making breath and sound, these common expressions can become encased in mystery.

While a teacher is an invaluable resource to a student, the student must also take responsibility for his or her own progress, which includes learning about the voice. A student of voice cannot possibly learn how to achieve greater control over his or her singing voice if he or she does not understand the physiological mechanisms to which his or her teacher is referring. It isnâ€™t necessary to memorize all the complex parts and functions of vocal anatomy, but it is helpful to gain a general and practical understanding of them. Comprehending the terminology (e.g., diaphragm, support, intercostal muscles, resonance, hard palate, placement, etc.) that a teacher uses during lessons will help vocal students make more consistent progress.

Vocal technique is as much a science as singing is an art form. While, initially, a student may have to concentrate very hard on his or her breathing, tone placement and muscle control, these techniques will become easier, more natural and even automatic in time, making singing much more enjoyable.

Needless to say, effective breathing technique is essential to good singing. Part of the process of studying voice is developing an acute awareness of the actions involved in breathing and exploring them in depth. A teacher is essential to helping a student gain control and thus confidence and trust in his or her own breath, and to guide him or her toward a greater understanding of the potential that breath carries for him or her as a performer.

The mechanism of breathing can be summarized in this way:

Receiving various signals from the nervous system, the diaphragmatic muscles contract and the diaphragm moves downward. As the diaphragm depresses, it creates a vacuum in the lungs and air rushes in to fill that vacuum. During exhalation, the diaphragm relaxes and rises and lung volume decreases, creating a positive pressure difference, and air rushes out.

Diaphragm

The (thoracic) diaphragm is a shelf of muscle and tendon that extends across the bottom of the ribcage, dividing the torso in two. Above is the thorax (chest), with the lungs and heart, below is the abdomen. It is dome-shaped, slightly higher on the right side, and curves up toward the centre. It features a boomerang-shaped central tendon - the aponeurosis - which is connected all around by muscular fibres that originate on the lumbar spine, the bottom edge of the ribcage and sternum (breastbone).

The heart, which is attached to the diaphragm via its pericardium - a membrane sac that envelops the heart - moves up and down with the diaphragm.

Lungs

The lungs are made of a soft, elastic, spongy tissue. Their structure is much like an inverted tree. Air enters the lungs via the trachea (the "trunk"). The trachea branches in two to form the bronchi. Each bronchus continues to branch out into bronchioles until, at the end of each bronchiole, a cluster of alveoli, which are small sacs where gas exchange of carbon dioxide and oxygen takes place, is reached. The total surface of the alveoli is very large.

As the ribcage and diaphragm move, the lungs are stretched, drawing air into the lung (inhalation), or the lungs are compressed, pushing the air out (exhalation).

Muscles

Most students of voice donâ€™t consider the importance of the support structure for the voice, yet the muscles of the back and abdomen aid the diaphragm and lungs in establishing the movements necessary for breathing.

The intercostal muscles are found between the ribs, and there are two kinds: The internal intercostal muscles (in the inside of the ribcage) extend from the front of the ribs, and go around the back, past the bend in the ribs. In front of the ribcage, looking from the bottom of each muscle (i.e. the top of each rib), the muscles go diagonally inward. The external intercostal muscles (on the outside of the ribcage) wrap around from the back of the rib almost to the end of the bony part of the rib in front. They go downward and outward when viewed from the back. (At the bottom of the sternum can be seen the transversus thoracis muscle.) These muscles can be felt during coughing.

Having the muscles on diagonals increases the amount of work that they can do, since a longer muscle can become shorter upon contraction than can a shorter, vertical muscle, as it contracts along the full length of the muscle fibres.

When proper diaphragmatic breathing technique is employed, and when a singer's endurance is being tested, the intercostal muscles can get a very good workout. Muscle fatigue is especially common amongst new vocal students who havenâ€™t yet built up strength in these muscles and are isolating them during singing for the first time.

The Abdominal Muscles

Often mistakenly called the diaphragm by singers and by some teachers, the abdominal muscles are linked with the breath when they are used to "support the breath" or when they stretch as the belly distends due to the action of the diaphragm.

The deepest of the abdominal muscles, the transversus abdominis, go horizontally from front to back. They are very important in respiration, and are probably instrumental in forced exhalation.

The external obliques course downward and inward, and are the largest and strongest abdominal muscles. These muscles work posturally by contracting and may flex or twist the spine. By compressing the abdomen, these muscles create higher pressure in the abdomen and thorax (chest), essential for forced expiration. Also, by relaxing these muscles, one can allow the distention of the belly to be more free, making the action of the diaphragm more easily felt.

Sandwiched in the middle between the external obliques and the transversus abdominis are the internal obliques. Their direction is down and out, or the opposite of the external obliques. They can be used to compress the abdomen for exhalation.

Muscles of the Lower Back

The muscles of the lower back are often overlooked by those studying voice. While some of these muscles are primarily flexors of the lower limb (i.e., thigh and pelvis), the quadratus lumborum serves as the equivalent muscle of exhalation to the abdominal muscles found in front. The psoas

major, a long muscle on the side of the lumbar region of the spine and brim of the pelvis (in front of the hip joint), connects with the muscles of the diaphragm.

In terms of respiration, the quadratus lumborum can be felt to stretch most easily when the abdominals in front are contracted and one "breathes into the lower back", allowing the diaphragm to push the organs of the abdomen against these muscles. On contraction, they serve as muscles of exhalation. They may also hold the lowest part of the ribs in place during inhalation, allowing the diaphragm to drop down more effectively.

Support

Support works by contracting the abdominal muscles, creating higher pressure in the abdomen and thorax, allowing the diaphragm's relaxation (and upward rise) to be more carefully controlled. There is less control in relaxing a muscle than there is in contracting it, so support gives performers a means of controlling their sound, or phonation.

Today, there are two main schools of teaching about the breath, although there are many different approaches: "supporting" the breath by compressing the abdomen during phonation (i.e., on the exhalation), or relaxing the abdominal muscles as much as possible during inhalation and phonation, allowing the diaphragm to work on the inhalation, and riding its relaxation on the outgoing breath (i.e., during phonation).

The extent to which action of the ribs is encouraged varies within most techniques, although most teachers, including myself, recommend that the upper torso, especially the shoulder girdle, be as relaxed as possible even during the most extreme vocal demands. Ultimately, a singer wants access to all the "breath resources" available without jeopardizing the ability to freely produce sound, that is without unnecessary tension.

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