Taking Root to Fly

Articles on Functional Anatomy

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2

On Breathing

Anyone who has ever pursued a physical discipline has been made aware of breathing, either by his or her own body or by the instructions of a teacher. Each of us has learned that while breath is essential for life and is completely automatic (you can't commit suicide by holding your breath because after a certain point you pass out and start breathing in spite of your will), it can nonetheless be altered in a wide variety of ways. Not only can breath be speeded up or slowed down, counted, held in or held out, but it can also feel like it is being initiated in different parts of the body. Often a dance student can become terribly confused, and out of breath, when one teacher suggests, "hold your chest high as if you were inhaling," while another says, "keep your ribs down so that your chest doesn't move when you breathe." Any new breathing technique seems to work well at first although the dancer may eventually find that his or her endurance is decreasing in the long run when trying to do only "abdominal" breathing or "hold the stomach in" and do only "chest" breathing. Fortunately, most of us don't pay any attention at all to our breathing when we are dancing strenuously so that the wisdom of our body takes over.

Perhaps a brief description of what happens under the surface when we breathe can help us make sense out of all the helpful hints we get about breathing. Our torso is divided into two main sections: the thoracic cavity and the abdominal cavity. The thoracic cavity includes everything contained in the rib cage which extends from

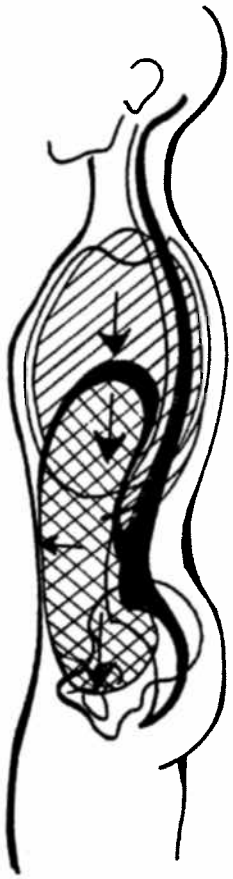

fig. 1—A schematic representation of the side view of the human trunk. The lined area represents the thoracic cavity, the crosshatched area the abdominal cavity, and the black area between the two cavities represents the diaphragm in a released (uncontracted) position. The arrows indicate that as the diaphragm contracts on an inhalation, the thoracic cavity floor will move down, causing the roof of the abdominal cavity to be lowered so that the abdominal contents will press outward toward the front of the trunk and downward into the pelvis.

the base of the neck to a few inches above the navel. Essentially, it is a sealed-off container for the lungs, with the heart resting in between. The abdominal cavity consists of the part of the trunk that begins at the lower border of the rib cage and fills the space down into the pelvis. This sack contains the digestive organs. The two cavities are separated by a thin strong muscle called the diaphragm. It attaches all around the lower border of the rib cage and ties down to the lower spine in back. It is like a hemisphere that arches up into the thoracic cavity forming both the roof of the abdominal cavity and the floor of the thoracic cavity.

During inhalation, the thoracic cavity must be enlarged so that air can rush into the lungs. The thoracic cavity can be increased in size by expanding the rib cage upward and outward to increase the circumference of the cavity. This increase is caused by the contraction of the muscles between the ribs, called the intercostal muscles. In the case of an extraordinarily large inhalation, muscles from the shoulders and the top of the rib cage going up to attach on the neck and skull can also contract to lift the rib cage even higher. Each rib attaches to the spine in the back of the trunk so that as we inhale, each rib can move upward and out from the spine. This means that while the rib cage tends to move as a whole, we can move segments of it in isolation. It also means that when the rib cage expands, we can see the movement around the entire trunk, in back as well as in front. The thoracic cavity is further increased by lowering its floor, in other words, by contracting the diaphragm so that it does not bulge up as far into the thoracic cavity. When the diaphragm contracts, it flattens downward to press on the top of the abdominal cavity. This increases the pressure in the abdomen causing the "stomach to stick out" if one is not contracting the abdominal muscles. Diaphragm contraction also results in a sensation of increasing pressure down into the pelvis if the abdominal muscles are contracting to maintain the "flat stomach." Because of the effect of the diaphragm on the abdomen, use of the diaphragm is called "belly" or "abdominal" breathing.[fig. 1]

During exhalation, the decrease in size of the thoracic cavity happens through a reversal of the above process. The muscles between the ribs and in the upper chest elongate, allowing the rib cage to narrow and drop due to the downward pull of gravity on the ribs. The diaphragm rises back up into the thoracic cavity as it is drawn there by the natural elasticity of the lungs to which it clings. The result is a decrease in the circumference and depth of the thoracic cavity which forces air out of the lungs as they are pressed flatter. For this reason, breathing moderately deeply, with particular attention to the exhalation, is an excellent and simple method of generally easing the neck, shoulder, and back areas.[fig. 2]

At this point it is easy to understand why the whole trunk either

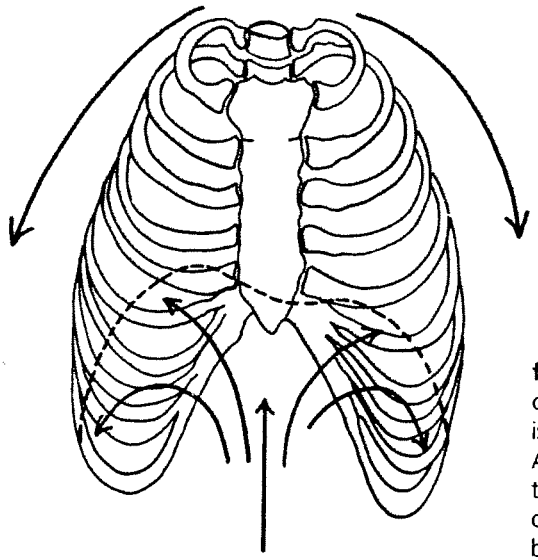

fig. 2—Front view of the rib cage. The top of the diaphragm is shown with a dotted line. Arrows indicate the motions of the rib cage and the diaphragm during the exhalation phase of breathing.

moves or experiences a change of pressure as one inhales and exhales. In order to achieve an optimum oxygen intake, expand the ribs as fully as possible without contracting the muscles of the neck so as not to constrict the passageway for the air from the nose to the lungs and inhibit the flow of air to them. At the same time contract the diaphragm as fully as possible without overly distorting the abdominal wall in the front of the trunk. Exhale as fully as possible without adding excess muscular effort since the more muscles used in contracting, the more rapidly is the supply of oxygen used.

It is important to passively let out as much air as possible since the amount of air left in the lungs from a previous inhalation limits the amount of fresh air that can be taken in during the next inhalation. The fresh air taken in has a higher level of necessary oxygen than the residual air left in the lungs, and the residual air has a higher level of carbon dioxide and other waste products from muscle and cellular metabolism. Thus it is easy to see that the body can function for a longer period of time at a level of high activity if as much air as possible is expelled after taking in as much fresh air as possible.

It becomes clear that much of the valuable advice on breathing given us is quite useful as long as it is all used simultaneously. Oxygen intake is increased when we use "chest breathing" as well as "abdominal breathing," breathing "from the back," "from the pelvis," and indeed "through the whole trunk." However, anyone who has tried to think of five things at once while executing a series of rapid and complicated dance steps knows that such experiments end at least in frustration and possibly painful accidents. If we think about our breathing at all when we are dancing, we must have one single

thought or image in mind that we can hold constant as we move. One unifying idea is imagining the breath going up and down the central axis of the body which extends from between the hip joints up through the pelvis, the center of the neck, between the ears, and on to the top of the head. One thinks of the breath just passing up and down this axis or pole continually neither controlling the breath rate nor bypassing any part of the length of the pole.

You can imagine your central axis acquiring "thickness" until it is a cylinder with a circumference expanded enough to encompass your whole trunk. Think of it expanding in all directions simultaneously as you inhale and shrinking simultaneously in all directions as you exhale so that it collapses around its core.

Many of us tend to automatically put too much or too little emphasis on various parts of our trunk when we breathe. One person may tend to squeeze the ribs down and close the throat so that the belly alone puffs out. Another person might tend to hold the rib cage high at all times so that the neck partially disappears even when he or she is exhaling. Both of these tendencies, often noticeable in dancers, decrease the oxygen potential and add unnecessary tension to the body.

If you are aware of "puffing out" a particular part of your body when you inhale, just watch your breath flow past that area through the very center of your trunk without getting stuck. Don't try to "suck in" a part that bulges out when you inhale as this will only increase your tension, but simply allow that part to be soft, deflated, and empty. Let it be fluid. In your mind's eye, see the air go past it rather than filling it. In the areas where you feel that you "squeeze down" or have "knots," watch the air flow by like a stream of water, to soften and dissolve them.

Paying attention to your breathing without controlling it requires a high degree of concentration. It is easiest to do when you don't have to deal with gravity as well. You might start watching your breathing while lying on your back. If you have a very deep chest and lying in this position throws your head back and your chin up in the air, you can put a small pillow or pad under your head, not your neck.

My favorite imagery for enhancing coordinated "chest" (costal) and "belly" (diaphragmatic) breathing comes from one of my colleagues, Lynn Martin, a specialist in breathing mechanics. I imagine that my trunk is a composite of two domed cylinders, one sitting above the other. The top cylinder is composed of my rib cage and thoracic vertebrae. The bottom cylinder, which fits part way up into the top cylinder, is composed of the diaphragm as its dome-top, the abdominal wall muscles as its walls, and the bony pelvis as its base. As I inhale, the top cylinder will rise slightly upward and simultaneously expand outward so that its circumference increases. Meanwhile, the bottom cylinder's dome-shaped roof will lower as its walls

expand outward to increase its circumference and firmly ground the bottom cylinder into the pelvic floor.

If I visualize the excursion upward and outward of the top cylinder during the inhalation, I will be increasing my costal breathing. If I visualize the excursion downward and outward of the bottom cylinder during the inhale, I will be increasing my diaphragmatic breathing. If I watch the two cylinders gently move apart at the very same instant, I am enhancing the coordination of all my respiratory muscles to increase the efficiency of my inhalation.

In order to sustain a longer and easier exhale, for speaking or singing, I imagine that the bottom cylinder begins to decrease its circumference at its base in the pelvis first so that it can then slowly rise up into the center of the top cylinder. After the bottom cylinder has begun to move upward at the beginning of the exhale, I imagine the top cylinder start to slowly and gently float down to rest ever so lightly above it. [fig. 3]

Do not attempt to control your rate or depth of breathing. When you are lying down quietly, your breath will automatically slow down and deepen without any effort on your part. Make sure you are really only thinking about the ideal flow of breath. Do not worry about or even think about what you believe to be your old, less efficient breathing patterns for you will only reinforce them by thinking about them. Don't think about how tense you are; only think about how the tension is dissolving with your breath flow.

If you find it difficult to allow a full exhalation or if you tend to force the air out of your lungs, think of your whole trunk as a big elas-

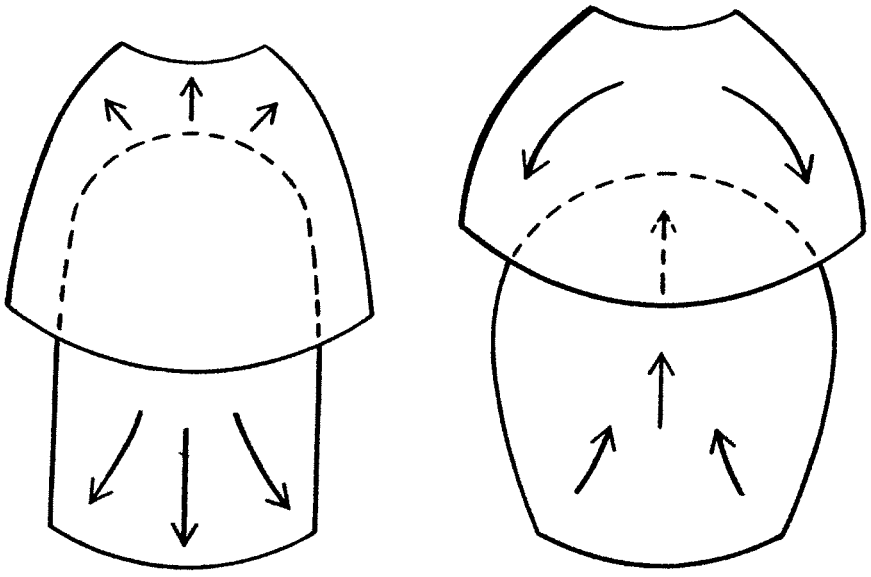

fig. 3—Representation of the trunk as two cylinders. The drawing on the left indicates the position of the two cylinders at the beginning of the inhalation. The arrows on this drawing show the directions in which the cylinders will move during the inhalation.
The drawing on the right indicates the position of the two cylinders at the beginning of the exhalation. The arrows on this second drawing show the directions in which the cylinders will move during the exhalation, be it silent or sung.

tic balloon whose natural elasticity expels the air out of your lungs when your wind pipe is open. Watch the balloon collapse all by itself to result in the flow of air out of your lungs. Actually allowing an "aaaah" or a "haa" sound to come out as you exhale can help. If the sound is clear, resonant and open, so is your chest and throat; if it is tight and high and jerky, go back to watching your center breathing and see if you can find the spot where the breath seems to be blocked. When you find it, just watch the breath flowing by, dissolving it and moving it out of you easily and gently with the sound. Make no effort at all to dissolve the block, just watch it flow away. If you can allow the making of sounds to give you pleasure, it is much easier to breathe fully and openly. Try playing with your breath. Be gentle and humorous. Laughter and lightness have a much greater effect on the dissipation of tension than hard, serious grasping and pushing.

When you are ready to get up, roll over on your side slowly. Using your hands to help you, stand up slowly so that your spine remains long and erect. Bend at your hip joints rather than in your spine to rise. Do not get up by raising your head and flexing your spine to create tension in your neck and distortion in your entire spine. Be careful not to jump up suddenly, since it may make you dizzy.

Once you are standing, allow yourself to continue breathing through your central axis. As you dance, your entire trunk will expand slightly in all directions as you inhale. This expansion will be almost imperceptible to someone watching, even if you take a rather deep breath, since it is distributed evenly around your central axis. For the same reason, a large inhalation will not undermine your balance even if you are balanced on one leg. As you exhale, your entire trunk will ease closer to your central axis, further enhancing the balance of your weight around a center core. As the central axis itself remains stable, there will be no sense of "collapse" as you exhale fully but only a sense of your body hanging lightly around it. Since your bones are more closely aligned around a central line, your muscles won't have to work as hard to hold you up against the pull of gravity.

You might now think of yourself as being like a pine tree whose trunk shoots up through its center growing always taller as the sap flows upward. At the same time, your outside—skin, arms, shoulders, ribs—hang all around you just as the tree's branches and leaves hang to move only in the wind, without effort.