

Vocal Health for Physical Educators

JOSH TROUT DOUGLAS MCCOLL

As “vocal athletes,” physical educators need to pay special attention to protecting their voice.

Evidence suggests that teaching can be hazardous to vocal health. For example, compared to individuals in other occupations, teachers are more likely to define themselves as having a voice problem (Smith, Lemke, Taylor, Kirchner, & Hoffman, 1998). Teachers are also more likely than nonteachers to have consulted a physician or speech-language pathologist about a voice disorder (Roy, Merrill, Thibeault, Parsa, Gray, & Smith, 2004). Sadly, teachers are more likely than nonteachers even to change occupations because of their voice problems (Roy, Merrill, Thibeault, Gray, & Smith, 2004). Physical education teachers, in particular, are at risk of vocal problems because they need to talk loudly or shout more than classroom teachers (Thibeault, Merrill, Roy, Gray, & Smith, 2004, p. 790).

In a classroom, teachers can communicate with students at a conversational volume (i.e., about 65 decibels), while physical educators must often project their voice over bouncing basketballs, boisterous students, and echoes bouncing off gymnasium walls. They may also have to give instructions to students spread out across a field outdoors, shout feedback to a swimmer underwater with splashing background noise, or give dance cues while music is playing. Simply stated, voice projection is a prerequisite for the job of every physical education teacher. Furthermore, teachers who also coach must project their voice during nightly practices and games.

Due to these intense daily demands, physical educators are considered “vocal athletes,” because their voice must be in top condition every day for peak performance. Unfortunately, overuse and abuse of the voice can lead to serious health consequences. Specifically, the vocal mechanism can be damaged, possibly leading to significant temporary or permanent loss of function.

This article will help readers understand vocal trauma (i.e., voice behaviors that damage vocal folds), vocal hygiene (i.e., use and care of the voice to keep it healthy), and pedagogical strategies that can help to minimize damage to the voice. This information will be useful not only to physical education teachers and coaches, but also to the faculty who educate preservice physical education teachers, since these topics are often neglected in preservice undergraduate curricula due to the lack of time in an already tightly packed program and the lack of awareness and expertise on the part of those who teach the courses (Eve, 1997).

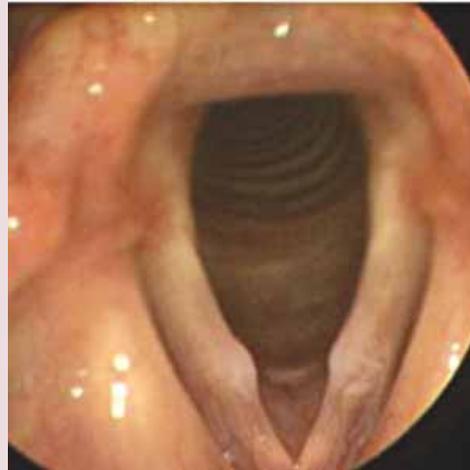
Laryngeal Anatomy and Physiology

The vocal cords, which are more accurately described as vocal *folds*, are composed of a small muscle pair known as the thyroarytenoids. These muscles are made up of complex layers of tissues, each layer of which has a distinct cellular characteristic. It

Figure 1. Normal Vocal Folds



Figure 2. Vocal Folds with Nodules



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is this very differentiation that allows for a normal sounding voice. Voicing occurs when the vocal folds vibrate during exhalation. The average number of vocal fold vibrations for an adult female is 200 cycles (opening and closing of the vocal folds) per second, while the average for an adult male is 125 cycles per second. The vocal folds remain healthy when the speaker produces speech at average levels of vocal intensity throughout life; however, physical education teachers often speak at higher-than-average vocal intensities. When a teacher frequently yells, the tissue layers of the vocal folds can become swollen and inflamed, resulting in a hoarse or weak voice (Boone, McFarlane, & Von Berg, 2005).

The average intensity level for conversational speech is 65 decibels (Borden, Harris, & Raphael, 2003). The vocal folds are fairly robust muscles that can tolerate a normal degree of intensity without swelling or inflammation. Loud and constant yelling, which is common in the physical education and coaching professions, can reach intensity levels well over 100 decibels (Fucci & Lass, 1999). The vocal folds are not designed to sustain this level of vocal intensity over time. The end result of such overuse is swelling and inflammation of the thyroarytenoid musculature (Boone et al., 2005). The voice will become hoarse and weak, and the physical education teacher might overcompensate by pushing the vocal mechanism even harder, in an attempt to produce a voice that can be heard. This is a vicious cycle that causes the voice to become worse over time and the teacher to push the voice harder and harder as the severity of the dysphonia (i.e., the disturbance of normal vocal function) increases.

As the dysphonic voice becomes worse, the swelling and inflammation of the vocal folds become more pronounced. Fluids will begin to build-up between the layers of the vocal folds, and without a significant reduction of speaking (vocal rest) as well as a total cessation of *all yelling*, small growths known as vocal nodules will develop (Boone et al., 2005). Figure 1 shows normal vocal folds, while figure 2 shows

diseased folds where vocal nodules have developed.

While vocal nodules are noncancerous, they will significantly limit vocal ability. Vocal nodules typically start as soft, pliable, fluid-filled lesions similar to blisters. It is at this stage of development that they can be effectively treated by a speech-language pathologist through several sessions of voice therapy. The voice therapy will require the physical education teacher to be vigilant in eliminating *all* phonotraumatic behaviors for a significant period of time. The intervention will be successful at this stage only if the teacher strictly follows the guidelines set forth by the speech-language pathologist. If the teacher does follow this recommendation, the nodules will likely reduce in size over time until they have been completely resolved. After the nodules have been eliminated, the physical education teacher will have to make changes in his or her voice use, otherwise the condition might recur (Boone et al., 2005).

In cases where a teacher does not seek treatment for the early-stage nodules, the nodular growths will become fibrous and hard, not unlike a callous. At this stage, voice therapy alone will not help enough. Instead, surgical intervention will be needed to remove the nodules. After the surgery, small areas of scar tissue will remain where the nodules were. The scar tissue itself can lead to a weak and moderately dysphonic voice, especially right after surgery. Some teachers push their voice in an attempt to compensate for the weak voice associated with the scar tissue, but it is common for the nodules to recur when the voice is pushed in this manner. It is crucial that the teacher seek treatment by a speech-language pathologist after vocal nodule surgery, in order to prevent the nodules from reoccurring (Boone et al., 2005).

Of course, the best approach to vocal health for a physical education teacher is to prevent vocal inflammation and vocal nodules from ever occurring. Although preventing vocal disease is always better than treating it, this is not always easy when teaching physical education. The automatic response



An inexpensive megaphone can save your voice.

of the teacher is to raise his or her voice so as to be heard and understood by the students through all the background noise. However, if strategies are not put into play to protect the voice, the vocal mechanism will suffer.

Pedagogical Tips for Vocal Health

Voice projection can be challenging. When projecting the voice outdoors, the voice fades as it travels because there are no walls to contain the sound waves. Background noises such as wind, rain, traffic, lawnmowers, and even airplanes or trains often worsen the problem. When projecting the voice indoors, as in a gymnasium, acoustics become a major problem. The high ceilings create an echo, making certain frequencies difficult to hear and understand. The following strategies can be implemented to preserve the voice, thereby reducing the risk of vocal disease.

Voice Amplification Devices. Employers and employees in many professions take steps to reduce work-related injuries, both acute (a sudden accident) and chronic (wear and tear over time). For example, someone moving heavy boxes in a warehouse may wear a lifting harness or belt to reduce lower-back injuries. Secretaries use padded wrist stabilizers when they type to prevent wrist deterioration. Similar measures should be taken to prevent vocal disease by those who project their voice at work.

Headset microphones using a wireless connection to portable speakers with built-in receivers have been designed specifically for physical education teachers and coaches. High-quality models cost around \$2,000 and can deliver 200 watts of power. Some have a built-in CD/MP3 player and run on rechargeable batteries that last up to 12 hours. If this sounds too expensive, handheld amplifiers with a microphone can be purchased for roughly \$150. Though less expensive, these produce only about 20 watts of power and can be cumbersome because the teacher must carry them everywhere. The least expensive voice amplification device is a megaphone (also called a bullhorn). For approximately \$25, a teacher could purchase a battery-operated megaphone

that delivers eight watts of power. To find these products, teachers could browse the Internet or search in a physical education equipment catalog. A voice amplification system is a pedagogical tool that can preserve vocal health whether the teacher is competing with loud ventilation systems in a gymnasium or competing with excessive background noise at an indoor pool.

Whistle and Hand Signals. When referees blow their whistle in a game, they communicate the type of call they are making and the subsequent penalty simply by using hand signals. Using their voice to shout the call to thousands of fans would be absurd, thus a system of hand signals and arm gestures is used instead. A similar system of nonverbal communication using a whistle and hand gestures can be used by physical education teachers and coaches. For example, if students are spread across a soccer field, one whistle blow and a single arm in the air could signal students to drop their equipment and quickly move to the instructor for further instruction. Two whistle blows and two arms in the air could signal the end of class, meaning that students should pick up the equipment and quickly move to the locker room. Whistles can also be used to start and stop activities or inform students to rotate stations. Whistles and hand signals can significantly reduce the need for projecting the voice.

Proximity. Simply stated, the closer you are to someone, the less volume is required for them to hear you. Teachers should avoid shouting feedback to students when they are spread across a large activity area. The National Association for Sport and Physical Education (2001) recommends providing “targeted, descriptive feedback” when teaching physical education. Less volume is needed if the teacher moves around dispensing specific feedback to individual students as opposed to general comments to the larger group. If information does need to be provided to everyone, teachers could use the “corner-up” method. Three whistle blows could prompt a “corner-up” within ten seconds, whereby students assemble in an “L” shape allowing the instructor to face all students and speak at a reasonable volume. For increased efficiency, tell students that when they hear the three-whistle-blow command, they are to shout “Corner-up!” one time to ensure that their classmates heard the whistle. This allows teachers to use the students’ voices to their advantage.

Posture. Poor posture can cause a person’s lungs to be unable to fully inflate and give the vocal system a steady air stream for speech. According to the Victoria (Australia) Department of Education (2000), poor posture can also cause a lack of flexibility in the muscles used for breathing and voice. When projecting the voice, they recommend aligning the ears over the shoulders, keeping the arms and legs relaxed, keeping the ribcage relaxed and lifted, and keeping the shoulders relaxed and lowered. In addition to posture, Rodgers (2002) also suggests exercises for centering, releasing, aligning, stretching, breathing, and supporting different parts of the body for safe voice projection.

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Taking Charge of Vocal Health

Vocal health is a serious issue that is too often ignored. If a teacher believes that his or her voice is being compromised due to overuse, then preventive steps must be taken immediately. Voice amplification devices allow the teacher to speak at a normal volume and the pedagogical tips noted earlier can reduce or even eliminate the need for voice projection. Teachers who believe that they have already sustained damage to their vocal folds should consult a physician and consider seeing a speech-language pathologist to minimize further trauma. If at all possible, however, teachers should not let a vocal condition deteriorate to that point. The phrase “an ounce of prevention is worth a pound of cure” resonates especially true in the world of voice projection and vocal health.

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Josh Trout (jtrout@csuchico.edu) is an assistant professor in the Department of Kinesiology, and Douglas McColl (dmccoll@cschico.edu) is an associate professor in the Department of Communication Arts & Sciences, at California State University-Chico, CA 95929.

the elderly, obese, or those exercising at very low workloads (Mahon, Stolen, & Gay, 2001).

Other methods of monitoring exercise intensity, such as calculating target heart rate zones, are not recommended for physical education classes, but for those who are training and conditioning for competition (Gilbert, 2005). The drawback to calculating target heart rate zones is the difficulty in finding an accurate formula to predict maximum heart rate. There are many new proposed formulas, but finding one to fit the entire class is also problematic and confusing if different formulas are needed for different class members. Thus, heart rate is best used along with the talk test or Borg scale to familiarize students with what their rates are during comfortable, moderate exercise.

Assessing Fitness Level

Various field tests exist to assess fitness levels, but many, such as the mile walk or 1.5 mile run, depend on how fast one can go for a certain distance, leaving unfit students to finish last or feel left behind. This can be discouraging to these students. Thus the test recommended to help the instructor get a better assessment of each student's cardiovascular fitness is Cooper's (1968) 12-minute walking/running test (table 2). Doing this test on a track makes it easier to measure how far (in miles) one has traveled in 12 minutes. It is best done after four to six weeks of training, so that some fitness has been achieved (Nieman, 2003). Teachers should know their students well enough to determine whether they will be motivated to work harder if they score in a low fitness category or discouraged and cease to enjoy the class if they find they are still unfit. In the latter case, including a fitness assessment may be counterproductive.

If the instructor determines that assessment can be a motivational tool, the following guidelines will help to maximize support and ensure safety:

Divide the class into two groups. One group will perform the test first while the other group cheers and encourages this first group and helps the instructor watch for any signs of physical distress. Then the groups will switch places. This test categorizes fitness levels according to age and gender, so it is ideal for classes that have diverse age groups as well as a mixture of males and females. Try to assign walkers and unfit students in one group and runners and highly fit students in the other group.

The Log Book

The exercise log book is a very important tool for both the student and the instructor. Students can make their own or purchase one, or the instructor can make a simple handout that includes the following: (1) a line for the date, (2) a line for the time spent doing exercise, (3) a line to describe the weather and course conditions, and (4) a line indicating whether the person felt any pain or discomfort, or suffered