Basic Information on
Neuromusculoskeletal and Vocal Health

Information and Recommendations for Faculty and Staff in Schools of Music

National **A**ssociation of **S**chools of **M**usic
Performing **A**rts **M**edicine **A**ssociation

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Introduction

The National Association of Schools of Music (NASM) and the Performing Arts Medicine Association (PAMA) have developed a comprehensive overview of neuromusculoskeletal and vocal health issues for postsecondary schools and departments of music.

This document provides a comprehensive overview for faculty and staff.

It is oriented toward decision-making about neuromusculoskeletal and vocal health in the context of a school or department of music.

Information of a medical nature is provided by PAMA; information regarding contextual issues in music programs, by NASM.

Please note: *Information in this Web resource is subject to amendment or change at any time without prior notice. Please refer back to the document from time to time.*

Use the hyperlinks in the fast tracks below or in the table of contents to link to specific sections.

Fast Tracks

- Neuromusculoskeletal and Vocal Health: The Basic Issues
- Contributing Factors
- Neuromusculoskeletal Issues Affecting the Body
- Neuromusculoskeletal Issues Affecting the Voice
- Neuromusculoskeletal and Vocal Health in Music Classrooms, Studios, Rehearsals, and Other Spaces

1. Organizations

NASM, founded in 1924, is an organization of schools, conservatories, colleges and universities with approximately 640 accredited institutional members. It establishes national standards for undergraduate and graduate degrees and other credentials and is the national music accrediting agency. NASM also provides information to potential students and parents, consultations, statistical information, professional development, and policy analysis.

PAMA, founded in 1989, is an organization composed of dedicated medical and health professionals, artists, educators, and administrators with the common goal of improving the healthcare of the performing artist. PAMA members are professionals in fields that include research, education, and clinical practice, and who hail from all corners of the globe.

2. Disclaimers

a. NASM and PAMA are providing this web resource for institutions that teach music to assist local consideration and action about neuromusculoskeletal and vocal health.

b. The information

- is generic, presentational, and advisory in character.
- is oriented far more to musicians and lay persons than to medical, scientific, or research professionals concerned with neuromusculoskeletal and/or vocal health.
- does not substitute for the professional judgments of medical and other professionals working in their areas of documented expertise.
- is not to be considered as professional advice or to be used as a basis for the medical treatment of specific individuals.
- does not supersede present and future empirical research that may confirm, contradict, expand, or change the medical or other information provided here at any point in time.
- does not serve as the basis for the accreditation function of NASM or as an addition to the accreditation standards and procedures of NASM. (A *Handbook* containing standards and a set of *Membership Procedures* are published separately by NASM.)
- is not an endorsement of the reference materials listed or cited; nor does it represent an endorsement of other opinions, methods, or approaches described in the text.

c. Health and safety depend in large part on the personal decisions of informed individuals. Institutions have health and safety responsibilities, but fulfillment of these responsibilities cannot and will not ensure any specific individual's health and safety. Too many factors beyond any institution's control are involved. Individuals have a critically important role and each is personally responsible for avoiding risk and preventing injuries to themselves before, during, and after study or employment at any institution. This set of advisory information on neuromusculoskeletal and vocal health and institutional actions taken under their influence or independently do not relieve the individual from personal responsibility for appropriate, prudent, and safe behavior or action, nor do they shift such responsibility and liability for the consequences of inappropriate, imprudent, and/or unsafe behavior or action in any instance or over time to any institution, or to NASM, or to PAMA.

3. Acknowledgements

NASM and PAMA acknowledge with gratitude the efforts of the many past and present professionals in various medical, health, research, and music-related fields who developed the scientific and practical information summarized in this set of resources. They express appreciation to the members of PAMA and NASM who made comments and suggestions on drafts of this and other documents in this Web resource.

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Part I. Neuromusculoskeletal and Vocal Health Facts and Concepts

Neuromusculoskeletal and Vocal Health: The Basic Issues

The human neuromusculoskeletal system is comprised of the nervous system, the muscular system, and the skeletal system. Together, these systems support the body's physical structure and enable movement.

In these resource documents, the term "neuromusculoskeletal" is used to encompass not only overt physical movements (the pressing of a key, the strumming of a string), but also the small internal movements our bodies make, for example to produce breath and modify vocal sounds.

Vocal health is referred to as a component of neuromusculoskeletal health within these documents. When the term "neuromusculoskeletal" is used, vocal health is included. Direct references to vocal health – for singers, instrumentalists, and future music teachers alike – are interspersed throughout the text. Special attention is devoted to issues of vocal health in the sections neuromusculoskeletal issues affecting the voice and vocal protection.

"Neuromusculoskeletal" also includes the body's position in space and the relationship of the skeletal system to corresponding muscles and tissues. Terms such as "alignment" or "posture," which often refer to spinal positioning, weight distribution, muscular support, and balance, are important talking points in conversations about musicians' neuromusculoskeletal health.

Good health and healthy behaviors are important to all musicians, regardless of instrument and area of specialization.

For example, although singers are usually provided with more detailed information during their voice studies, basic overview understanding of vocal health is essential for all musicians. All use their voice in speaking, and many are engaged with the singing voice in their roles as conductors, coaches, teachers, recording engineers, researchers, therapists, and so forth.

The various neuromusculoskeletal and vocal disorders that affect musicians have many varied contributing factors. Some may be genetic in nature or result from an infection. Others may be the result of trauma or injury. Still others are related to certain behaviors, either in isolation or those that are repeated over time.

Musicians coping with or developing certain neuromusculoskeletal conditions, complications, or disorders may find that they have a negative impact on their ability to play, sing, and practice music.

Preventative measures need to be taken by individual musicians and institutions where musicians study and work. These may include, but are not limited to the provision of information, applications of information in decision-making and culture building, and modifications to the musician-instrument interface.

Purpose of this Web Resource

This web resource is focused on neuromusculoskeletal health, on neuromusculoskeletal disorders related to the musician's body and voice, on preventative measures, and on how schools and departments of music can work appropriately and comprehensively with associated medical, health, educational, public information, legal, and other issues.

This information is to be used in service of a goal in individual institutions to provide conditions that support neuromusculoskeletal and vocal health.

The first essential is information about neuromusculoskeletal and vocal health and preventative action.

Without knowledge of what can happen and how to minimize risk, music students and professionals have little basis for making informed decisions to care for their neuromusculoskeletal and vocal health and that of other musicians with whom they work.

For each school or department of music, neuromusculoskeletal and vocal health are addressed in a multi-faceted context.

Charting an effective course to promote and provide the best environment for neuromusculoskeletal and vocal health means working with many issues and forces beyond providing information for students, faculty, and administrators.

To be successful, a comprehensive neuromusculoskeletal and vocal health program needs to be sustained from year to year.

This resource provides the basis for instructional efforts to provide information and develop a plan for supporting neuromusculoskeletal and vocal health with a particular focus on minimizing conditions that could contribute to singing and playing-related neuromusculoskeletal disorders.

Basic Facts

Music, the Musician, and Neuromusculoskeletal Health

Musical performance is a physical activity that involves movements both big and small, those we can see and those inside the body.

Musical performance involves the conscious positioning of the body into specified playing and/or singing postures, some of which may seem unnatural at first.

A musician's practice routine is often physically demanding and time-intensive.

For serious musicians, especially those studying, singing, and playing music at advanced levels, "days off" are few and far between.

Some musicians, at some point in their careers, may develop one or more neuromusculoskeletal conditions, complications, or disorders related to their engagement in musical activities.

Decisions about practice and performance play an important part in the neuromusculoskeletal health of musicians, but numerous factors contribute to an individual's neuromusculoskeletal fitness.

Musicians are responsible for their art form, and for supporting the well-being of other musicians.

Cultivating the most positive personal and professional relationships between musical performance and neuromusculoskeletal health is part of that responsibility.

Like so many issues in music itself, optimum effectiveness depends on balanced applications of knowledge and skill in varying circumstances by thousands of individual student, professional, and amateur musicians day after day.

The Neuromusculoskeletal System

The musculoskeletal system is a complex system of muscles, tendons, ligaments, bones, joints, and associated tissues that move the body, allow for speech, and that help the human body to maintain its form.

The term "neuromusculoskeletal" expands upon "musculoskeletal" to include the nervous system.

The nervous system coordinates voluntary and involuntary actions and transmits signals to different parts of the body.

The nervous system is comprised of the central nervous system (CNS) and the peripheral nervous system (PNS). The central nervous system includes brain and spinal cord. The peripheral nervous system is made up primarily of nerves, which allow the central nervous system to communicate with the rest of the body.

Vocal Anatomy

The human voice is produced by four component systems. These are often referred to as the "generator," the "vibrator," the "resonator," and the "articulator."

The "generator" is the breath provided by the lungs. The principle muscle involved in breath is the diaphragm, a dome-shaped muscle that extends along the bottom of the rib cage. The diaphragm is assisted by various muscles in the abdomen, ribs, chest, and back.

The "vibrator" is the larynx, commonly referred to as "the voice box." Horizontally stretched across the larynx are two infoldings of mucous membrane called vocal folds, or more frequently "vocal cords." When breath regulated by the generator passes along the vocal folds, vibrations occur.

The "resonator" is the resonating cavity above the larynx that is responsible for giving the voice its tonal quality. This resonating cavity includes the vocal tract, much of the pharynx (the throat), the oral cavity, and the nasal passages.

The "articulator" includes the tongue, lips, cheeks, teeth, and palate. These structures help to shape sounds into recognizable words and specific vocalizations.

These four component parts work together to produce human speech and singing.

Disorders of the Neuromusculoskeletal System

The causes and contributing factors of neuromusculoskeletal disorders vary, but they generally fall into the one of the following categories: (1) genetic or related to a pre-existing medical condition, (2) trauma- or injury-related, (3) behavior-related.

Common symptoms of neuromusculoskeletal disorders include pain, stiffness, aching, throbbing, cramping, and muscle weakness.

Some disorders may be permanent, while others may be temporary.

Those disorders that are temporary may respond well to rest and/or behavior modification. Others may require medical intervention or therapy.

Sustained behavior modification may lead to the elimination or reduction of certain symptoms or disorders.

Contributing Factors

The causes of behavior-related neuromusculoskeletal disorders are manifold. However, most fit into one of two basic categories or factors. They are: 1) overuse and/or misuse and 2) genetic factors.

1. Overuse/Misuse

The human body has certain physical limits. Exceeding these limits can often lead to injury. In the arts-medicine arena, "overuse" is defined as a practice or activity in which anatomically normal structures are used in a so-called normal manner, but to a degree that has exceeds their biological limits. Such overuse produces certain physical changes, often accompanied by corresponding symptoms or complaints. The degree of excessive activity needed to produce these results varies from person to person and seems to be related to a person's individual anatomy and physiology.

Another key term in this category is misuse. "Misuse" is defined as a practice in which anatomically normal structures are used in an abnormal manner and/or to an excessive degree, sufficient to produce specific symptoms. Such misuse places certain bodily structures under stress.

Related to both overuse and misuse is abuse. Abuse should be considered as a causative or contributing factor when an activity is performed not only excessively (overuse) or improperly (misuse), but also in a conscious, willful manner. Such self-imposed abuse often produces deleterious physical effects. Under certain circumstances, both overuse and misuse can turn into abuse. A common example of abuse is "playing through the pain." This abuse involves persisting in long intervals of practice or performance in the face of pain without appropriate rest breaks or activity modification. Some examples of vocal abuse in singers include repeated instances of singing too loudly or singing out of range. Abuse may also be the use of dangerous substances.

2. Genetic Factors

For instrumentalists, the most common genetic factor influencing behavior-related neuromusculoskeletal disorders is hypermobility. It is also known as joint hyperlaxity or the trait of being "double jointed." Such instability of certain joints may predispose an individual to muscle pain syndromes and/or tendinitis, an inflammation of the tendon. (A tendon is a tough band of fibrous connective tissue that connects muscle to bone.)

Hypermobile joints possess a greater than normal range of motion. Individuals with hypermobile joints have the tendency to compensate for the instability of the joint by using more muscle tension when completing movements or tasks involving the joint. While this extra muscle tension allows for better control over certain movements, such tension can actually increase one's risk of damaging or straining a muscle.

Individuals with hypermobile joints are generally advised to monitor and actively reduce the amount of tension that they carry in their muscles. Specific strengthening exercises can also help, and in

some instances, people with hypermobile joints may be well served by external methods of joint support, such as small ring splints or tape.

Musicians and Risk Factors

Two facts are clear:

- Neuromusculoskeletal health is essential for musicians.
- Many behavior-related neuromusculoskeletal disorders are preventable.

Two conclusions are obvious:

- Musicians have basic neuromusculoskeletal health responsibilities
- Healthy neuromusculoskeletal behaviors are a critically important addition to the musician's portfolio of essential disciplines.

Constant attention is necessary, because in many cases neuromusculoskeletal damage develops gradually over time.

The severe or advanced symptoms of certain neuromusculoskeletal disorders may be career-ending for a musician.

Even if debilitating problems do not occur initially, career activity becomes increasingly difficult and finally impossible as neuromusculoskeletal disorders proceed to more advanced stages.

What do these facts and conclusions mean for musicians and for schools and departments of music?

Musicians necessarily engage in repeated neuromusculoskeletal behaviors and hold particular postures when they rehearse and perform. But such behaviors and postures do not equal automatic risk of one or more neuromusculoskeletal disorders. There are many factors involved in benchmarking and determining the inherent physical risk.

For musicians, managing neuromusculoskeletal health starts with understanding basic facts and avoiding the most obvious problematic behaviors, postures, and situations.

A behavior is risky when it involves overuse, misuse, or abuse of certain bodily components, or if it fails to recognize and adapt to an individual's physical limitations, genetic or otherwise. A list of basics is provided in ***Contributing Factors.***

There is more, however. Like most other decisions in advanced music-making, thoughtful judgments about what to do and what not to do for yourself and for others involve gaining in-depth knowledge and applying it with sophisticated understanding.

In all musical settings, a number of variables are interacting at the same time. These interactions are unique to specific settings and situations.

Four major variables influence a musician's risk for singing- and playing-related neuromusculoskeletal disorders. Some are intrinsic; others are extrinsic to the musician. Some may be modifiable; others, non-modifiable.

The four main categories of risk factors include:

1. ***Intrinsic factors – non-modifiable.***

   a) *Gender.* Studies reveal a greater prevalence of problems in female than male instrumentalists. This seems to be related to the smaller average size of the female hand and fingers, as well as the relatively smaller bulk and cross-sectional dimensions of their muscles. On average, female muscle strength is 15% less than that of males.

      With regard to vocal range, or the span of "musically useful" pitches that a singer can produce, female musicians tend to have higher ranges than their male counterparts.

   b) *Anatomy.* For instrumentalists, intrinsic factors such as height, hand size, lung capacity, and joint hypermobility may affect the ways students play certain instruments and, in some cases, may affect their choice of repertoire.

      For singers, intrinsic factors include lung capacity, vocal range, tessitura, and timbre among others. These factors affect the assignment of voice type (bass, baritone, tenor, countertenor, contralto, mezzo-soprano, and soprano) and, as a result, the parts and songs that singers are expected and selected to sing.

      Anatomy is unchangeable, so it is important to develop technique and an approach to playing and singing music that takes this situation into account.

2. ***Intrinsic factors – modifiable.***

   a) *Alignment.* Poor body alignment, sometimes referred to as "bad posture," can increase the risk of injury. Proper body alignment, including good balance and body positioning, is vital to the continued health of musicians.

   b) *Quality of movement.* Since sound is the result of movement, both at micro and macro levels, the quality of a musical sound is related, at some level, to the musician's quality of movement. It is important that musicians work to maintain high levels of body awareness in order to avoid bound, stiff, or limited movements that can lead to injury.

   c) *Stress and psychological health.* Musicians, like anyone else, are more susceptible to injuries, pain, etc. when under stress and/or depressed. Many of the neuromusculoskeletal problems for which musicians are at risk can, if they become chronic, contribute to a situation that may lead to depression. It is important for musicians to recognize the importance of their psychological health as a part of their overall physical health.

   d) *Motivation and effort.* Improving one's muscle strength and endurance depends on motivation and consistent effort. Exercise and conditioning are important. In some instances, musicians may need to seek expert guidance from a physical therapist, somatic educator, vocal coach, or other healthcare specialist.

3. Extrinsic factors – non-modifiable.

a) *The assigned musical repertoire.* Certain musical pieces pose particular physical and vocal challenges.

b) *Venue.* Once selected, the space in which one is performing can make injury more or less likely. The acoustics, temperature, lighting, and seating all have an effect on a musician's performance.

c) *Instrument.* While instruments can be modified to some extent, some characteristics cannot be changed. The frequency of injuries is higher among players of those instruments requiring many repetitions of finger action, as well as instruments that must be held in difficult postures.

Players of large instruments have a greater prevalence of problems. Long arms are needed to hold and play the instrument. Hands must stretch wider to press strings, keys, or valves; this requires greater muscle tension and increased use of the smaller and weaker intrinsic hand muscles. Additionally, these instruments are more difficult to play quickly than smaller instruments because of the greater size and complexity of keywork and valve travel, or greater space between strings and fingerboard.

4. Extrinsic factors - modifiable

a) *Time spent playing or singing.* Perhaps the single most important risk factor that musicians can manage is time: how much time one spends practicing, frequency and nature of rest breaks during practice sessions, how quickly one increases practice time when a major performance is approaching, and how one approaches more technically demanding passages.

b) *Non-music-related activities.* An often-overlooked risk factor involves non-music-related activities, some of which can be sources of overuse or misuse.

Some fitness and conditioning activities, including sports participation, may place excessive demands on the neuromusculoskeletal system, especially if overdone or done incorrectly. (This is not to say, however, that such activities should be avoided all together, only that engagement should be at safe levels, utilizing proper technique and form.)

In some instances, excessive use of certain electronic devices, including computers, tablets, cell phones, and gaming systems, can pose a risk. As in many things, moderation is key.

Loud social events and those in which cigarette smoke or alcohol are in abundance pose a serious risk to vocal health.

Similarly, some forms of outside employment may also be physically or vocally demanding.

Neuromusculoskeletal Issues Affecting the Body

Muscle Pain

Whether one ascribes muscle pain to overuse, misuse, postural factors, tension, technical problems, or poor conditioning, the principal underlying cause of muscle pain is sore muscles.

Muscles that are fatigued are less able to contract as strongly and frequently as "normal" muscles. With continued use, fatigued muscles are placed under greater stress, often leading to microscopic damage and disruption of the muscle fibers, a condition known as *muscle strain*.

Muscle contraction is a physical-chemical process. When the necessary chemical compounds are in short supply, muscles can no longer operate at optimal efficiency. Furthermore, muscle contraction produces lactic acid; when this substance accumulates in tissues, it minimizes the muscle's ability to continue efficient contractions.

Both of these consequences of excess muscle use will cause pain during and after the period of use. Once the period of activity is over, some of these side effects will correct themselves. In other instances, muscular pain will continue for variable periods of time.

Playing-related neuromusculoskeletal disorders in all age groups are more commonly seen in specific body locations. Paramount among these are the shoulders, neck, hands/fingers/wrists, and lower back. Some of these locations are more common in specific instruments, e.g., thumb problems in clarinetists, lower back strain and pain in double bass players.

Neuropathies

"Neuropathy" is a general medical term that refers to diseases or malfunctions of the nerves. Neuropathies are classified according to the types or location of the affected nerves.

Focal neuropathy is neuropathy that is restricted to one nerve or group of nerves, or to a particular area of the body. Symptoms usually appear suddenly and can include pain; sensory disturbances, such as numbness, tingling, "pins and needles" sensations, burning, or even itching; and weakness. In the case of bodily extremities, the pain may occur at the site of a nerve compression or entrapment, which occurs when a nerve passes through a narrowed channel bounded by bone, fibrous bands, bulky muscles, or enlarged arteries on its way to or from its ultimate destination.

In other cases, the pain may be distributed anywhere along the course of the nerve. Muscle weakness and impaired dexterity are often later effects.

The three most commonly identified entrapment neuropathies include 1) carpal tunnel syndrome at the wrist, 2) ulnar neuropathy, and 3) thoracic outlet syndrome.

Carpal tunnel syndrome occurs when the median nerve, which runs from the forearm into the palm of the hand, becomes pressed or squeezed at the wrist. The carpal tunnel – a narrow, rigid passageway of ligament and bones at the base of the hand – contains the median nerve and several tendons. When irritated or strained, these tendons may swell and narrow the tunnel, compressing the median nerve. The result can be pain, weakness, or numbness in the hand and wrist that radiates up the arm. Causes are numerous and varied.

Ulnar neuropathy is a condition in which the ulnar nerve, which runs from the neck along the inside edge of the arm and into the hand on the side of the little (pinky) finger, becomes inflamed due to compression of the nerve. Symptoms include tingling, numbness, weakness, and pain, primarily along the elbow, the underside of the forearm, and along the wrist or inside edge of the hand. Compression of the ulnar nerve is often linked to repetitive wrist or elbow movements. For musicians, sustained elbow flexion, particularly among players of bowed instruments, has been known to contribute to this condition in some cases.

Thoracic outlet syndrome is a group of disorders that occur when the blood vessels or nerves in the thoracic outlet – the space between the collarbone and first rib, become compressed. Symptoms include pain in the neck and shoulder areas and numbness in fingers.

Dystonia

Dystonia is defined as a disorder of sustained muscular contractions, producing unwanted movements or abnormal postures. The cause of dystonia remains unclear.

Focal dystonia is dystonia that affects a particular area of the body. Because men are more likely to develop focal dystonia, it is hypothesized that genetic or hormonal factors may be involved. Additionally, repetitive movements, especially those that are painful, seem to trigger it.

In the instrumental musician, dystonia typically presents symptoms that are localized to the upper limb in keyboard, string, percussion, and woodwind players, and that involve the embouchure in brass and some woodwind players.

The right hand of keyboard players and the left hand of string instrumentalists are most commonly affected.

Neuromusculoskeletal Issues Affecting the Voice

The more common neurological voice disorders in the music student include phonatory instability, vocal strain, and vocal fold motion abnormalities.

Phonatory Instability

Phonation is the process by which air pressure generated by the lungs is converted into audible vibrations. A method of phonation called "voicing" occurs when air from the lungs passes along the vocal folds at the base of the larynx, causing them to vibrate.

Production of a tonal, pleasant voice with smooth changes in loudness and pitch depends upon the symmetrical shape and movement of the vocal folds.

Phonatory instability occurs when there is asymmetrical or irregular motion of the vocal folds that is superimposed on the vocal fold vibration. Phonatory instability often manifests itself as an unsteadiness, hoarseness, or roughness of voice. The condition can be short- or long-term.

Short-term causes of phonatory instability include fatigue, certain medications, drug use, and anxiety. These problems tend to resolve rapidly with removal of the cause, but remain if the causative agent fails to be eliminated.

Over-the-counter allergy medications, antidepressants, and highly caffeinated drinks, which stimulate the nervous system, can cause vocal tremors, a form of phonatory instability.

Vocal Strain and Vocal Fold Abnormalities

Overuse of the voice, whether by singing or speaking, can produce vocal strain. Unlike playing an instrument, singers must be aware of problems singing at the extremes of vocal range, especially the upper end. Both duration and intensity of singing are as important as they are for instrumentalists.

Misuse activities can occur also; examples of this are attempting repertoire that is beyond the individual's stage of vocal maturity and development, and improperly learning and practicing certain vocal styles.

Prolonged overuse, in some cases, can lead to the development of nodules on the vocal folds. The nodules appear initially as soft, swollen spots on the vocal folds, but as vocal abuse continues, they transform into callous-like growths. Vocal nodules require specialized and prolonged treatment and rehabilitation and can be of grave consequence to singers.

Basic Protection for All Musicians

On stage and in life, it is important for musicians to take steps to protect their neuromusculoskeletal health. Musicians and music faculty whose playing-and singing-related behaviors make them susceptible to certain neuromusculoskeletal conditions and disorders may wish to explore the following methods of neuromusculoskeletal health protection:

- Warming up before practice and performance. As appropriate, engage in physical, vocal, and musical warm-up exercises. Mobilize muscles and joints in order to increase blood flow to those body parts that will be moving rapidly and frequently during the playing and performing of music. Lubricate your vocal folds.

- Taking a break from practice and rehearsal whenever possible. A good rule of thumb is a 5-minute rest every half hour.

- Avoiding excessive practice time and stress. Set daily limits, and vary repertoire during practice sessions.

- Avoiding excessive repetition of difficult repertoire, especially if progress is slow.

- Avoiding repertoire that is beyond one's technical or physical reach.

- Refraining from sudden increases in practice times. Instead, slightly reduce total practice time before juries, recitals, etc. in order to allow mind and body adequate energy for performance.

- Ensuring proper body alignment and technique. Be mindful of balance and weight delivery, and ensure adequate freedom of movement and support during practice and performance. If appropriate, adapt an instrument or make use of external support mechanisms, such as shoulder rests, neck straps, and flute crutches.

- Maintaining good "mental hygiene." This includes getting adequate sleep, good nutrition, regular exercise, and spending time with friends and family. Refrain from hazardous or recreational drug use. Seek the help of a mental health professional when appropriate.

- Allowing for relaxation. Injuries are much less likely to occur in persons who are both physically and psychologically fit. Stress management is as important as practice management.

Vocal Protection

It is equally important for musicians to take steps to protect their vocal health. This holds true for all musicians, regardless of performance medium or area of specialization. Musicians may wish to explore the following methods of vocal health protection:

- Drinking plenty of water. The vocal folds need to be lubricated with a thin layer of mucus in order to vibrate efficiently. The best lubrication is achieved by drinking plenty of water. Aim to drink at least eight glasses of water a day.

- Avoiding and/or limiting consumption of caffeinated and alcoholic beverages, as they pull water out of your system and deplete the vocal folds of needed lubrication. If you choose to drink caffeine or alcohol, be sure to sufficiently increase your water intake.

- Not smoking. Smoking irritates and dries out the lining of the larynx. It contributes to decreased vocal quality, promotes reflux laryngitis, and increases the need for throat clearing and "smoker's cough." Smoking is also extremely detrimental to lung function, which can make breathing, speaking, and singing more difficult. Also, work to avoid exposure to secondhand smoke.

- Being mindful of antihistamine usage, which dries out the vocal tissues. Be sure to stay well hydrated if you are taking allergy medication. Certain other medications, both prescription and over-the-counter, may have a similar drying effect. When in doubt, check with your doctor and, if appropriate, ask about suitable alternatives.

- Avoiding dry air environments. Forced heat, air conditioners, and climates with low levels of environmental moisture can be hard on your vocal health. Consider using a humidifier at night to compensate for the dryness.

- Avoiding yelling or raising your voice unnecessarily.

- Avoiding throat clearing and voiced coughing.

- Using vocal amplification systems when available and appropriate.

- Resting your voice, especially if you are sick. Remember, it's important to give yourself adequate time to recover.

A Special Consideration – Marching Music

Marching music is an important part of many colleges and universities. It is usually connected with athletic programs and events. The marching musician must not only be able to play an instrument at a high level of skill, but do it while moving along a street or across an athletic field, often at rapid rates and with irregular movement patterns. Additional physical capabilities are necessary for this to be accomplished without danger. Marching musicians require high levels of physical conditioning, strength, and endurance; they must be in good general health and physically fit.

Additionally, training in marching music produces an additional litany of activity-related physical disorders that must be considered in any school's health program. Problems unique to marching music include lower extremity injuries such as sprained ankles, toe contusions, and knee strains. Carrying heavy instruments places a great physical demand on the neck, torso, lower back, and legs. Training usually occurs outside during the summer, sometimes in high heat and high humidity. Sunburn and dehydration can occur all too easily in the absence of preventative measures. Times of rest and rehydration are vital for marching units. Finally, marching units are usually much larger than most indoor ensembles, and their sound levels often exceed recommended levels, especially during long rehearsals.

Basics Music Professionals Need to Know and Be Able to Do

- Understand and share with others the risks inherent in excessive and improper neuromusculoskeletal use while playing and singing music, including the risk of prolonged or permanent damage to musculoskeletal and neurological tissues.

- Recognize that playing and singing music in inappropriate ways or for extended times can cause playing and singing-related neuromusculoskeletal disorders.

- Monitor practice time and intensity, choice of repertoire, and playing and singing techniques to prevent the development of playing- and singing-related disorders.

- Apply health knowledge in specific musical contexts, such as practice, performance, production, education, competition, and listening.

Students need to gain these knowledge and skills during the course of their studies and preferably as soon as possible.

Part II. Considerations for Faculty and Staff

Please find below a number of ways you can promote neuromusculoskeletal health in your faculty or staff role.

Neuromusculoskeletal and Vocal Health in Music Classrooms, Studios, Rehearsals, and Other Spaces

- Help students understand the importance of neuromusculoskeletal and vocal health and their ultimate responsibility for acting with care and appropriate restraint. If you teach performance, help students understand health issues specific to their instrument or the voice.

- Provide time for your students to physically and musically "warm up" at the start of rehearsal.

- Encourage singers to begin their warm ups by vocalizing in the most comfortable mid-range of their voice before gradually moving to the higher and lower extremes of their vocal range.

- Provide breaks for your students during rehearsal. This rest time is beneficial to their ability to concentrate and to protect their hearing, vocal, and neuromusculoskeletal health.

- Work to avoid seating and visibility issues within ensembles.

- Encourage proper body alignment for both seated and standing performers.

- If appropriate, speak with students and administrators about musician support mechanisms, such as shoulder rests, neck straps, and flute crutches.

- Consider the use of amplification devices for singers, especially during rehearsals.

- Establish a protocol for students who complain of neuromusculoskeletal or vocal pain during a rehearsal or class. For instance, you may request that they "sit on the sidelines," remain actively engaged in the rehearsal or class, and take notes in their music. You also have the authority to excuse them from class if the situation warrants.

- If you suspect that a student is developing a neuromusculoskeletal or vocal condition or disorder (or if he or she reports a physical difficulty in playing, singing, or speaking), refer the student to the appropriate student health personnel at the institution. Your advice *must not* take the place of that of a licensed or certified medical or healthcare professional. Acting in this capacity exposes you to potential liability.

Ideas and Recommendations for Music Schools and Departments

Here are some ideas, courtesy of other institutions, schools of music, and departments:

- Institute a neuromusculoskeletal health awareness policy within the music school or department.

- Establish a mechanism for addressing concerns related to issues of neuromusculoskeletal health for faculty, staff, and students.

- Consider making performance-grade musician support mechanisms available to students, either on a complimentary basis or for purchase.

Conclusion

As educators, you and your colleagues are tasked with preparing the next generation of musicians. Some may go on to play professionally, others may decide to teach, and still others will embrace music as a life-long hobby. Whatever their future aspirations, students' neuromusculoskeletal health is vital to their success as musicians and to their overall happiness.

Neuromusculoskeletal and vocal health are essential, too, for faculty and staff engaged in playing and teaching music.

The playing- and singing-related overuse, misuse, or abuse of certain muscles, joints, ligaments, tendons, and vocal tissues can contribute to the development of certain neuromusculoskeletal disorders. Outside, non-musical behaviors that physically strain the body or the voice, or that compromise a musician's psychological health, may also be contributing factors. It is important to understand and avoid those risk factors that can compromise neuromusculoskeletal fitness and ability.

With this document, we hope we have shed some light on an important issue and perhaps inspired you to take new or additional steps in various aspects of your own work.

Resources – Information and Research

NASM-PAMA Resource Documents and Orientation Materials

Information and Recommendations for Administrators and Faculty in Schools of Music

Protect Your Neuromusculoskeletal Health Every Day: Information and Recommendations for Student Musicians

A Sample Order and Script for Music Student Orientation

Standard Version
Version for Customization

Student Text Version of the Orientation Script

Standard Version
Version for Customization

Protecting Your Neuromusculoskeletal Health: Student Information Sheet

Standard Version
Version for Customization

Protecting Your Vocal Health: Student Information Sheet

Standard Version
Version for Customization

Neuromusculoskeletal and Vocal Health Project Partners

National Association of School of Music (NASM)
http://nasm.arts-accredit.org/

Performing Arts Medicine Association (PAMA)
http://www.artsmed.org/index.html

PAMA Bibliography (search tool)
http://www.artsmed.org/bibliography.html

Medical Organizations Focused on Neuromusculoskeletal and Vocal Health

American Academy of Neurology
(http://www.aan.com)

American Academy of Orthopaedic Surgeons
(http://www.aaos.org)

American Academy of Otolaryngology – Head and Neck Surgery
(http://www.entnet.org)

American Academy of Physical Medicine and Rehabilitation
(http://www.aapmr.org)

American Association for Hand Surgery
(http://www.handsurgery.org)

American Laryngological Association
(http://www.alahns.org)

The American Occupational Therapy Association, Inc.
(www.aota.org)

American Psychiatric Association
(www.psych.org)

American Psychological Association
(www.apa.org)

American Physical Therapy Association
(http://www.apta.org)

American Society for Surgery of the Hand
(www.assh.org)

American Speech-Language-Hearing Association
(http://www.asha.org)

National Center for Complementary and Alternative Medicine
(http://nccam.nih.gov)

Other Resources on Neuromusculoskeletal and Vocal Health

Athletes and the Arts
(http://athletesandthearts.com)

National Association of Teachers of Singing
(http://www.nats.org)