

# The Healthy Musician: Hearing, Vocal, and Musculoskeletal Health

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## F. Facilities, Equipment, Technology, Health, and Safety

### I. Standards

i. It is the obligation of the institution that **all students in music programs be fully apprised of health and safety issues, hazards, and procedures inherent in practice, performance, teaching and listening both in general and as applicable to their specific specializations.** This includes but is not limited to information regarding hearing, vocal, and musculoskeletal health and injury prevention, and the use, proper handling, and operation of potentially dangerous materials, equipment, and technology. Music program policies, protocols, and operations must reflect attention to injury prevention and to the relationships among musicians' health, the fitness and safety of equipment and technology, and the acoustic and other health-related conditions in practice, rehearsal, and performance facilities. Specific methods for addressing these issues are the prerogative of the institution.

*NOTE: 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 can 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. The NASM standards above and applicable guidelines below, and institutional actions taken under their influence or independently do not alter or cancel any individual's personal responsibility, or in any way shift personal responsibility for the results of any individual's personal decisions or actions in any instance or over time to any institution, or to NASM.*

# Hearing Health

- **Hearing Loss:**
  - **Conductive Hearing Loss:** “occurs in the outer or middle ear where sound waves are not able to carry all the way through the inner ear. Sound may be blocked by earwax or a foreign object located in the ear canal, the middle ear space may be impacted by fluid and infection or a bone abnormality, or the eardrum may have been injured.”

# Hearing Health

- Hearing Loss:
  - Sensorineural Hearing Loss: “Occurs when the inner ear or the actual hearing nerve itself becomes damaged. This loss generally occurs when some of the hair cells within the cochlea are damaged. Sensorineural loss is the most common type of hearing loss.

# Hearing Health

- Hearing Loss:
  - Sensorineural Hearing Loss : This type of hearing loss results from “aging, exposure to loud noise, injury, disease, oto-toxic drugs or an inherited condition. This type of hearing loss is typically not medically or surgically treatable.”

Source: Johns Hopkins Medicine, “Types of Hearing,”  
[http://www.hopkinsmedicine.org/hearing/hearing\\_loss/types\\_of\\_hearing\\_loss.html](http://www.hopkinsmedicine.org/hearing/hearing_loss/types_of_hearing_loss.html) (accessed January 10, 2013).

# Hearing Health

- **Hearing Loss and Musicians:**
  - Hearing loss is “particularly significant for musicians...if the aural feedback loop is disrupted, the brain has no way to accurately monitor sounds that are produced. The result is reduced ability to control intonation, amplitude, and timbre, and (for singers) to project clear diction.”

# Hearing Health

- OSHA Regulations:
  - Scott McCoy in his book Your Voice: An Inside View provides OSHA regulations of “maximum exposure by amplitude, beyond which hearing protection is required.”

Duration of Exposure	Average Amplitude
8 hours	90 dB
6 hours	92 dB
4 hours	95 dB
3 hours	97 dB
2 hours	100 dB
1.5 hours	102 dB
1 hour	105 dB
.5 hour	110 dB
.25 hour or less	115 dB

Source: Scott McCoy, *Your Voice: An Inside View*, 2 ed. (Deleware: Inside View Press), 173.

# Hearing Health

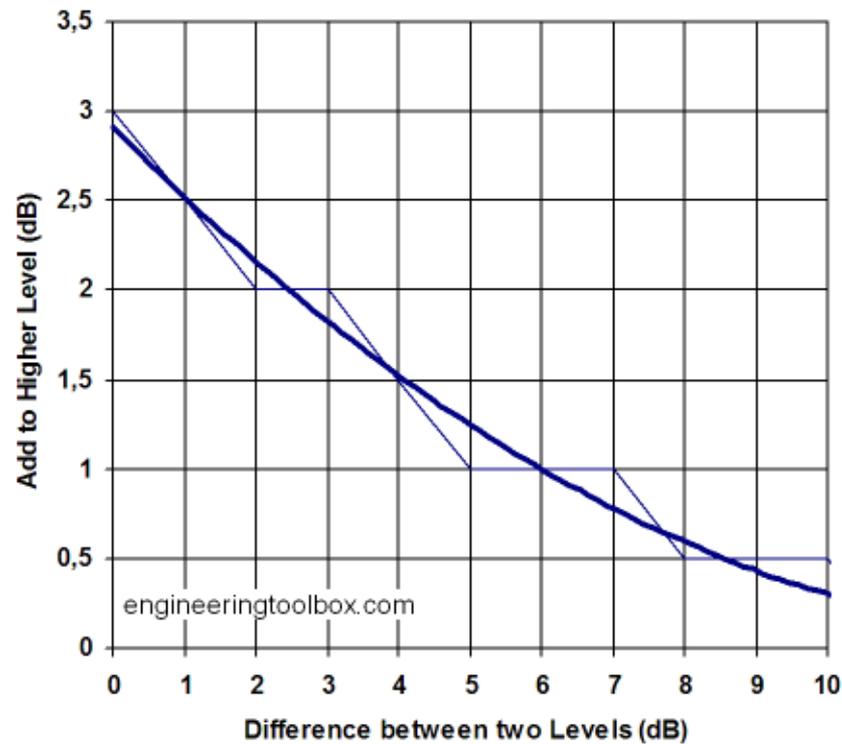
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## Sound levels of Instruments

Duration of Exposure	Average Amplitude
Violin	84-103 dB
Cello	84-92 dB
Piccolo	95-112 dB
Flute	85-111 dB
Clarinet	92-103 dB
French Horn	90-106 dB
Oboe	80-94 dB
Trombone	85-114 dB
Xylophone	90-92 dB

# Hearing Health



Source: <http://docs.engineeringtoolbox.com/documents/63/adding-different-sound-power-levels.png>

# Hearing Health

“...these instruments are capable of producing sound pressure levels high enough to cause hearing damage with prolonged exposure; indeed, the trombone is capable of playing loudly enough for OSHA to expect hearing protection after only 15 minutes!”

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Additionally, musicians are at a high risk of hearing loss do to the amount of music of which they are listening. Especially through headphone speakers. “Those tiny headphone speakers are only about 25mm away from the eardrum and can easily produce damaging sound pressure levels.”

# Hearing Health

## POSSIBLE SOLUTIONS

1. Be aware of the amount of noise exposure. (Especially students and teachers in the studios.)
2. “If you experience ringing in the ears (tinnitus), you may be exposing yourself to too much loud sound.
3. A set of custom fit musician’s earplugs from an audiologist is a suggested aid in order to prevent hearing loss.

# Vocal Health

Lucinda Halstead, MD and Scott McCoy, DMA have provided rudimentary information about disorders of the voice in [Your Voice: An Inside View](#) (2<sup>nd</sup> edition) published in 2012. Their material listed in the following slides is by no means intended to be used to diagnose a vocal issue without consultation with a laryngologist.

## ABUSE, MISUSE, and OVERUSE

VOCAL ABUSE – anything that can do physical harm to the vocal folds.

VOCAL MISUSE – using the voice in a manner in which it is not intended.

VOCAL OVERUSE – continuing to use the voice when fatigue has appeared.

# Vocal Health

- **Speak Well:**
  - Speak with correct breath support and a resonant voice quality
  - Avoid speaking with “vocal fry”
  - Find your optimum speaking range
  - Use electronic amplification when speaking to groups
- **Sing Well:**
  - Sing with healthy technique at all times.
  - Sing in your optimum tessitura
  - Sing with proper body alignment and correct laryngeal position



Source:  
<http://nolamusickitchen.files.wordpress.com/2011/07/healthy2.png>

# Vocal Health

- **Moderation:**
  - Limit the number of hours spent singing and talking.
  - Know your personal limits.
- **Hydration:**
  - Drink 8-12 large glasses of water per day.
  - Avoid dehydrating beverages that contain caffeine or alcohol.
  - Don't smoke



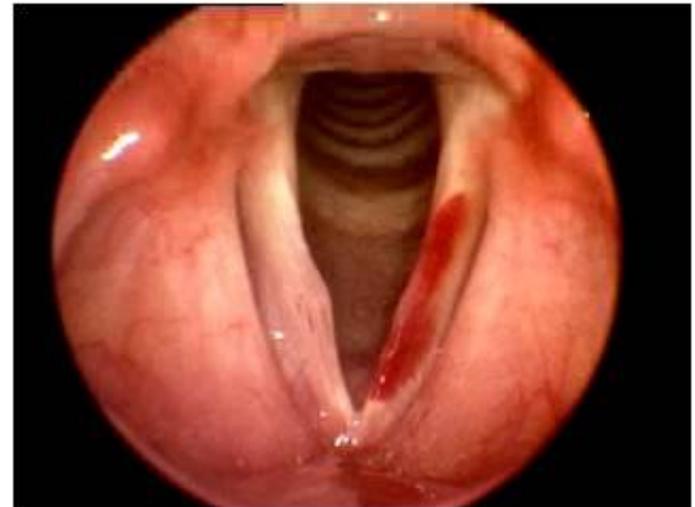
Source:  
<http://voicehealth101.com/content-images/Nodules1.png>

# Vocal Health

- **Rest:**
  - Try to maintain regular sleep patterns
  - Avoid strenuous voice use when the body is abnormally fatigued
- **Use Good Hygiene:**
  - Colds and respiratory infections can sometimes be avoided through frequent, thorough hand washing.

# Vocal Health

- Avoid unnecessary drug use:
  - **Ask your physician about possible voice-related side effects for any medications.**
  - Avoid antihistamines and decongestants
  - Avoid aspirin, ibuprofen and other non-steroidal anti-inflammatories
  - Avoid performance altering drugs
  - Avoid Alcohol
  - Avoid cannabis (marijuana) smoke – more damaging than tobacco smoke
  - Avoid Methylenedioxymethamphetamine.



Source:  
[http://www.casa.org/sites/default/files/photos/image\\_65/Fig%204%20Vocal%20fold%20hemorrhage.jpg](http://www.casa.org/sites/default/files/photos/image_65/Fig%204%20Vocal%20fold%20hemorrhage.jpg)

# Vocal Health

- **Stay physically fit:**
  - Good physical fitness helps stave off illness
  - Sustain energy levels required for performing
  - Maintain ideal body weight
  - Avoid Eating Disorders
    - Large amounts of acid can lead to swelling of the vocal folds
- **Practice “Safe Sex”:**
  - Sexually transmitted diseases can infect the vocal tract and larynx.

# Vocal Health

- Don't Sing if you are ill:
  - If your illness has a negative impact on your voice – DON'T SING!
- Know a Good Laryngologist:
  - Visit with a trusted laryngologist who can scope you on a “well” visit to establish a baseline
  - Don't wait until you are in vocal distress before seeing a laryngologist
  - Learn to recognize symptoms of voice disorders
  - Make it an effort to find a doctor whose specialty is the singing voice

# Musculoskeletal Health

“This lifestyle (musicians/dancers) demands extreme physical and emotional stressors that are far outside the normal range of standard occupations and even most competitive sports.”

- Musculoskeletal injury in the musician
- Overuse syndrome
- Focal Moto Dystonias
- Osteoarthritis
- Joint Hypermobility

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Musculoskeletal injury in the musician

- “Instrumental musicians are a special risk group for musculoskeletal injuries.”
  - Incorrect posture
  - Nonergonomic Technique
  - Excessive Force
  - Overuse
  - Insufficient Rest
- “Injuries can be devastating, leading to pain, which can be artistically and professionally limiting, or even career ending, with deleterious effects on the musician’s physical, emotional, and financial well-being.”

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Musculoskeletal injury in the musician
  - SIGNS AND SYMPTOMS
    - Pain
    - Weakness
    - Reduced Range of Motion
    - Numbness
    - Tingling
    - Loss of Muscular Control
  - RISK FACTORS
    - Environmental Risk Factors
      - Temperature of Room
      - Confined Space
      - Poor Equipment
      - Surfaces
      - Lighting

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Musculoskeletal injury in the musician
  - RISK FACTORS (cont.)
    - Physical Demands
      - Awkward postures
      - Forceful Exertion
      - Repetition
      - Long-Duration Activities with inadequate rest
      - Vibration
    - Personal Characteristics
      - Individual posture
      - Strength
      - Flexibility
      - Endurance
      - Comorbid health conditions

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Overuse Syndrome

- “The predominant feature of this syndrome is pain, and it is believed to be the most prevalent medical problem affecting musicians.”
  - “There may...be weakness or loss of fine motor control, but sensory symptoms are absent. Symptoms often develop after a change from the usual routine and may only be present just after or during performance. “
    - Factors:
      - Physical disproportion between instrument and the musician
      - Poor Posture
      - Fatigue
      - Excessive finger angulation
      - Biomechanical preconditions (hypermobility or hypomobility of critical joints)

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Overuse Syndrome
  - Treatment
    - Rest (Primarily)
  - Ergonomic Modifications
    - Straps to support weight of instrument
    - Keys on woodwind instruments altered for ease of fingering
    - Chair height/Seat Adjustment

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Overuse Syndrome
  - “When play resumes....”
    - Optimizing proper warm up
    - Relaxation training
    - Hydration
    - Proper Diet
    - Physical Conditioning

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Focal Motor Dystonias

- “Rare but perhaps most debilitating problems for the instrumentalist.”
  - Found mostly in keyboard players, string players, and woodwind players
    - Painless spasm
    - Involuntary movements in the affected limb
- Treatment
  - “To date, the pathogenesis of focal motor dystonia is unknown, and there is no proven definitive treatment.”

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Osteoarthritis

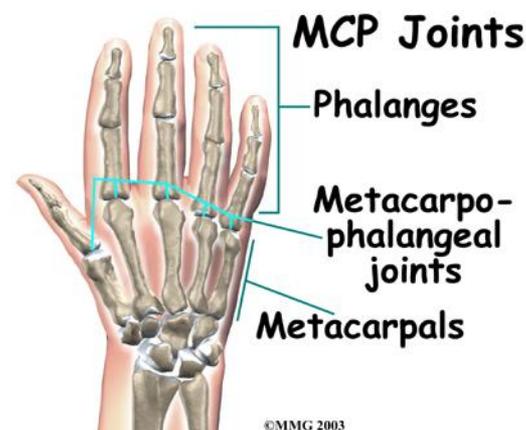
- “Osteoarthritis...takes on special significance in the musical performer. Musicians depend on their bodies and specifically their hands for their livelihood.”
- A problem commonly seen in the aging musician.
  - Symptoms:
    - Pain
    - Joint Stiffness
    - Loss of Range of Motion

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Osteoarthritis

- Joints commonly affected ...
  - Metacarpalphalangeal (MCP)
  - Distal Interphalangeal (DIP)
  - Carpometacarpal (CMC)

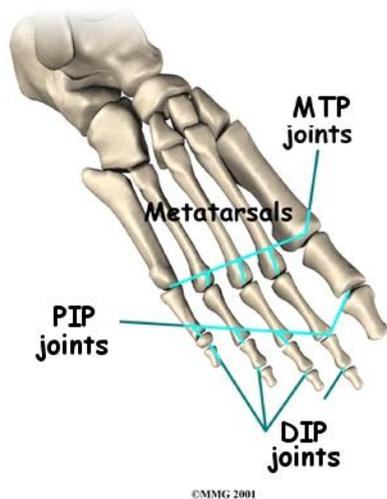


Source:  
[http://www.physioplushealth.com/media/img/377/hand\\_anatomy\\_mcp01.jpg](http://www.physioplushealth.com/media/img/377/hand_anatomy_mcp01.jpg)

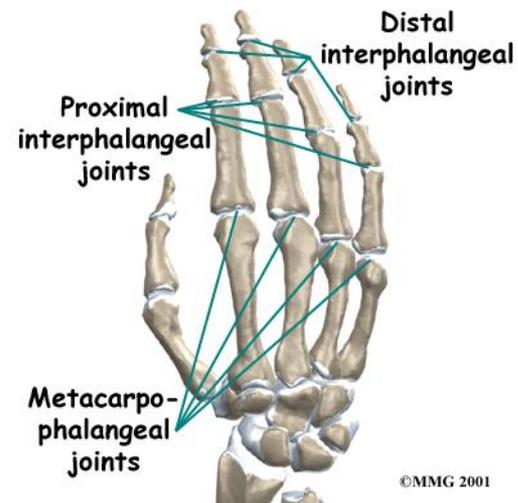
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# Musculoskeletal Health

- Osteoarthritis



Source:  
[http://www.eorthopod.com/sites/default/files/images/foot\\_clawtoes\\_anato2.jpg](http://www.eorthopod.com/sites/default/files/images/foot_clawtoes_anato2.jpg)

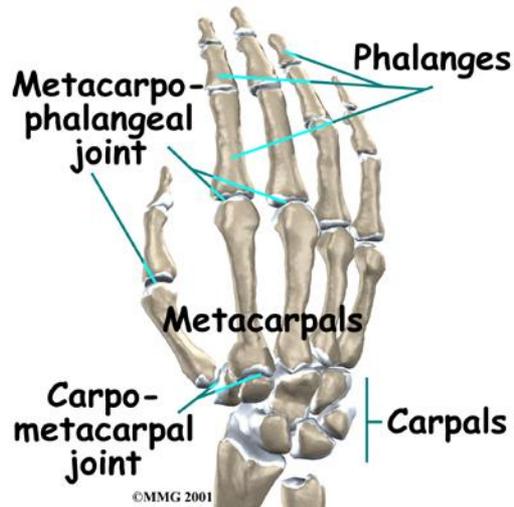


Source:  
[http://www.parkwayphysiotherapy.ca/media/img/438/finger\\_PIPinjury\\_anatomy01.jpg](http://www.parkwayphysiotherapy.ca/media/img/438/finger_PIPinjury_anatomy01.jpg)

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Musculoskeletal Health

- Osteoarthritis



Source:  
[http://patientsites.com/media/img/396/hand\\_cmc\\_anato1.jpg](http://patientsites.com/media/img/396/hand_cmc_anato1.jpg)

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# Musculoskeletal Health

- Osteoarthritis

- “Hypermobility can lead to instability of the loaded joint and, in turn, lead to the development of traumatic synovitis in instrumentalists. Hypermobility can also lead to digital nerve compression, and hyperextensibility of the wrist and elbow may contribute to neuropathy.”
  - Treatment:
    - Improved stability
    - Increased muscle tone and endurance

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).

# Prevention

- Musicians and their Instruments

- Prevention is key...

- “The constant demand for perfection and the high anxiety involved with job uncertainty, make this population (musicians) especially vulnerable to the ‘play now, pay later’ attitude. It is our job...to help musicians and in particular young music students, to see that preventative strategies are in their best interests for a long and fulfilling musical career.”

Source: Pamela A. Hansen, M.D. and Kristi Reed, M.D., “Common Musculoskeletal Problems in the Performing Artist,” *Physical Medicine and Rehabilitation Clinics of North America* 17, no. 4 (November 2006), [http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA\\_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf](http://www.med.nyu.edu/pmr/residency/resources/PMR%20clinics%20NA/PMR%20clinics%20NA_performing%20arts%20medicine/MSK%20problems%20in%20performing%20artists.pdf) (accessed January 11, 2013).