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Ways to Improve Your Practice through Better Understanding of Physical Demands

by Victoria Voronyansky

Muscles, Tendons, and Ligaments: makeup and functions

It is in the highly competitive environment of the conservatory that most of us for the first time come face to face with performance-related injuries. If left untreated, these injuries will eventually or even immediately impinge on further development of a performance career. The purpose of this article is to help you understand your body and its SOS signals, as well as to explain common injuries and ways to prevent and treat them.

Understanding the Constitution of Tendons and Ligaments

When it comes to injury prevention and treatment, one of the most encouraging qualities of tendons and ligaments is that the tissue, no matter how much stress it has endured, is naturally equipped to repair the damage by producing collagen. Furthermore, the simple act of raising body temperature through motion and warmth makes the ground substance in the tendons and ligaments more malleable and fluid, allowing for greater mobility. The injury to tendons and ligaments usually takes place when the tissue becomes too lax from overstretching, or when the fibers of the tissue are torn due to overuse and insufficient opportunity for regeneration of tissue.

Fiber arrangement in the tendons and ligaments is primarily parallel. When one is involved in a repetitive activity, the tissue can stretch too much and become lax. As a result of injury, some of the fibers are torn, and tissue begins the process of repair, but if tendons or ligaments are not cared for properly following an injury, the parallel fiber arrangement in the tendons is lost. That in turn can permanently limit flexibility and negatively affect the range of motion. Higher metabolism and body temperature, sufficient hydration, proper nutrients and ergonomically friendly work conditions can all help keep your tendons and ligaments in good health.

In case of an injury you should get help as soon as possible. As with any illness, the sooner you can be diagnosed and treated the better your chance is for a full recovery. Find out from colleagues and teachers about hand therapy specialists, and get an appointment at the first sign of an injury.

Injury Prevention

In traditional western medicine, the emphasis for centuries has been on treatment rather than prevention. While it has led to great progress in eliminating or treating the multitude of diseases that have plagued the world, the preventive side of medicine has been greatly neglected. Luckily for today's generation, the influences of eastern medicine, where the emphasis has been centered on prevention, are as close as the nearest computer, bookstore, or library. This article is dedicated to the topic of injury prevention for violists, in and out of the practice room.

Warm-up and stretching in your practice session:

Prior to practice, warm-up and stretching are key to keeping your body prepared for the upcoming physical strains. A common misconception is that stretching alone will prevent injury. In reality stretching on its own merits expands your range of motion, but does nothing for injury prevention per se. Often people stretch, expecting that the action will prevent an injury, but if they stretch their muscles while cold, and not properly warmed up, they will in fact increase the likelihood of injury while practicing.

Therefore it is necessary to warm up your muscles prior to stretching. The warm-up accomplishes two key things: it improves circulation, and drives the body temperature up, hence elongating collagen fibers. As a result of the higher body temperature, the blood and lymph fluids in

the muscles thin, hence increasing the elasticity of the muscles. This in turn reduces the likelihood of an injury.

The way to warm up, dependent on your fitness level, is for eight to twelve minutes to walk at a moderate pace, do some jumping jacks, or run. Even as little as three minutes of warm-up can reduce your risk of overuse injury. Another possibility for warm-up is to apply heat to your muscles, but this approach targets only specific areas, and does not help the body overall, so moderate physical activity like walking is preferred. After the warm-up is complete, the stretching, which will increase the range of motion, should follow. Slow controlled stretching is better in terms of injury prevention than ballistic stretching, which can contribute to injury. The same principles apply to warm-up prior to working out at a gym, walking, or jogging.

Some gentle stretches after you finish practicing can be very helpful in injury prevention as well.

Pre-practice warm-up for your muscles

Step 1. Walk in place for one to two minutes.

Step 2. Brisk aerobic activity for anywhere between two and eight minutes (jumping jacks, jogging, climbing stairs, stationary bicycling, etc.)

Step 3. Gradually slow down the pace, and take one or two minutes to walk slowly and stabilize breathing.

Step 4. Stretch.

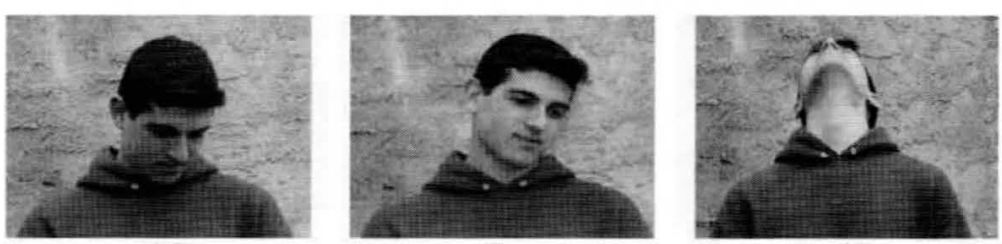
Stretch 1: Neck and trapezius muscles stretch:

- Throughout each stretch, shoulders should remain relaxed (feel as if the shoulders are dropping down).

Starting position: look straight ahead, relax neck muscles, and allow your head to drop slowly to the side (1a).

Stretch: From one stretch to the next slowly roll your head, and at 1b, 1c, 1d, 1e, and 1f hold the stretch 30 seconds.

1a 1b 1c



1d 1e 1f

Stretches 2 and 3: Arm and back muscles stretch:

- During every stage of the stretch take deep, slow breaths. Also when performing the stretch, try to extend both hands as much as possible. As in Stretch 1, try to keep shoulders relaxed.

Starting position: drop hands at sides, look straight ahead, make sure the palms are facing each other.

Stretch: From one stretch to the next slowly move your arms from one stage to the next. Hold each position indicated in the picture for 20 to 30 seconds.


2a


2b


2c


2d


3a


3b

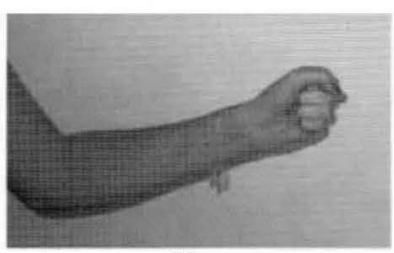

3c

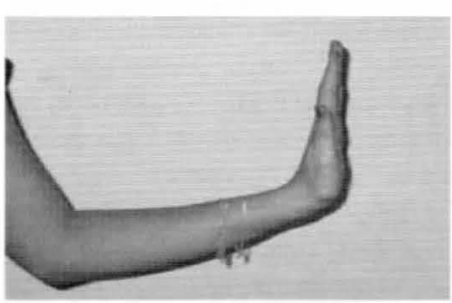

3d

Stretch 4: Hand muscles stretch:

- Hold each position for eight to twelve seconds. Go through each stretch with right and left hands.


4a


4b


4c


4d

Strength Training and Weight Lifting

Outside of your practice it is important to work out in order to increase the strength of your muscles and bones. For that, aerobic exercise alone is not enough. Weight lifting and strength training help tremendously in preserving and strengthening bones and muscles.

In weight and strength training it is important to work on all of the muscles, but several muscle groups should receive special attention. For violists these muscle areas are:

1. Muscles of the shoulder joint
2. Muscles of the shoulder girdle
3. Elbow muscles
4. Wrist muscles
5. Muscles around the vertebral column

If all of these muscles are worked on regularly with strength training, weight training, and resistance training, the injury prevention benefits will be very significant. Several things to be aware of in weight training are:

1. **Adequate rest.** It is generally recommended to take at least a 48-hour break between training sessions in order to allow time for muscle tissue to rebuild.
2. **Breathing.** When lifting weights it is important to pay attention to the frequency and quality of your breathing. Usually breathing out when muscle contracts and breathing in when muscle elongates is best.
3. **Muscle focus.** When working on a specific muscle group, focus your attention on keeping correct form and on executing movements with the muscles that you are targeting. Frequent injury results from lifting weights by using the wrong muscle groups.
4. **Appropriate weight.** Make sure you use the appropriate amount of weight. Overexertion can lead to injury.

Before you begin a weight- and strength-training program, make sure you speak with a doctor and a physical therapist. Some exercises may be inappropriate or harmful for you. Also consult a certified athletic trainer (ATC) or a Certified Strength and Conditioning Specialist (CSCS) or a physical therapist on correct form for exercises you intend to do.

Vitamins, Minerals, and Herbs

Several vitamins, minerals, and herbs have positive effects on tissue rebuilding and preservation. Consuming foods and supplements rich in these substances can be of great benefit to the maintenance and repair of muscles and bones, as well as contributing to improvement in elasticity of connective tissue.

Vitamins

Vitamin A (Beta-carotene): Necessary for growth of bones. Can be found in sweet potatoes, carrots, cantaloupe, leafy vegetables, broccoli, squash.

Vitamin B1 (Thiamine): Maintains normal function of nervous and muscular systems. Can be found in meat, wheat germ, oatmeal, cereals, enriched pastas, fresh peas, beans, oranges.

Vitamin C: Helps form collagen in connective tissue. Abundant in citrus fruits and juices, strawberries, vegetables.

Vitamin D: Necessary for proper bone growth and development. Can be found in egg yolks, fortified cereals, cod liver oil, salmon, sardines, herring, mackerel, and is developed by your skin when exposed to unfiltered sunlight.

Vitamin E: Improves muscle strength. Can be found in wheat germ, whole-wheat flour, vegetable oils, and spinach.

Minerals

Potassium: Necessary for normal muscle contraction. Can be found in potatoes, fresh fruit, fish, citrus and tomato juices, milk, nuts, raisins, canned sardines, whole grain cereals.

Calcium: Helps in nerve and muscle function. Can be found in milk products, green leafy vegetables.

Manganese: Aids bone and cartilage maintenance. Helps to form collagen. Can be found in avocados, whole grains, seeds, nuts, spinach, canned pineapple juice.

Water: It is important to drink enough! Eight to ten glasses per day.

Supplements and herbs

Rosemary oil and Eucalyptus oil (not taken in combination): Both herbs have similar effects: taken internally, they can help control muscle spasms. Applied topically, these oils improve circulation.

Glucosamine and Chondroitin (usually combined): When combined both of these substances have been found to relieve joint pain and inflammation, as well as increase flexibility of tendons and ligaments. The use of these substances causes controversy among doctors in the U.S., but in Europe this substance combination has been widely used since the 1980s.

****Before you take any of the vitamins, minerals, or herbs listed here, or embark on an exercise regimen, please consult your doctor.***

Warning signs of common injuries associated with playing the viola

Although there are numerous injuries which we are susceptible to due to playing the viola on a daily basis, in this article I will concentrate on three illnesses which are among the most common injuries caused by repetitive motion and overuse.

Tendonitis: A condition in which a tendon is inflamed or irritated. Most common symptoms are pain and tenderness near a joint, which is aggravated by movement.

Carpal Tunnel Syndrome: Located in the wrists, this is a condition in which the tissues of the carpal tunnel become swollen and inflamed. The swelling puts pressure on the median nerve, located in the middle of the wrist. Carpal tunnel syndrome is characterized by numbness and pain, eventually making the hand weaker. Warning signs include tingling and numbness in the fingers, especially at night, and possible loss of feeling in the hand, which indicates an advanced stage of this condition.

Rotator cuff injury: A condition in which there is a strain or tear in the tendons and muscles that surround the shoulder joint. Most common symptoms are pain and weakness, and in some cases restricted movement in the shoulder socket area. Rotator cuff injury is made up of one or more different conditions: *tendonitis* (discussed above), *tear of the muscle fibers*, and *bursitis*. Poor posture and repetitive stress are among the main causes of this problem.

Definitions and functions

The following are some concise definitions of the structures discussed above. Although a lot of this information may be already known to you, or considered common knowledge, I feel that some of this information may enhance your understanding of injuries and prevention techniques.

Bone: Bone is the matter that forms the skeleton of the body. Its contents are mainly calcium phosphate and calcium carbonate. It is also an accumulation area for calcium, assisting in balancing the level of calcium in the blood.

There are 206 bones, which serve the purpose of protecting internal organs (i.e., the skull protects the brain and the ribs protect the lungs). Muscles tug against bones to make the body move. Bone marrow, the soft, spongy tissue in the center of many bones, makes and stores blood cells.

Cartilage: Hard, elastic tissue, which pads bones at joints. A more flexible kind of cartilage connects muscles with bones and makes up other parts of the body, such as the larynx and the outside parts of the ears.

Ligament: A ligament is a tough band of connective tissue that connects bone to bone.

Muscle: Muscle is the tissue of the body which primarily functions as a source of power. There are three types of muscle in the body. Muscle which is responsible for moving extremities and external areas of the body is called "skeletal muscle." Heart muscle is called "cardiac muscle." Muscle that is in the walls of arteries and the bowel is called "smooth muscle."

Skeletal muscle: Represents the majority of the muscular tissue in the body. Skeletal muscle is the type of muscle which powers movement of the skeleton as in walking and lifting.

Cardiac muscle: A type of muscle with unique features only found in the heart. The cardiac muscle is the muscle of the heart and medically is called the myocardium ("myo-" being the prefix denoting muscle).

Smooth muscle: Generally forms the supporting tissue of blood vessels and hollow internal organs such as the stomach, intestine, and bladder. So named because of the absence of microscopic lines called "cross-striations" which are seen in the other two types.

Tendon: The tissue by which a muscle attaches to bone. A tendon is somewhat flexible, but fibrous and tough. Tendons are like ligaments in being tough, flexible cords. But tendons differ from ligaments in that tendons extend from muscle to bone whereas ligaments go from bone to bone as at a joint. Despite their tough fibrous nature, tendons and ligaments are both considered "soft tissue," that is, soft as compared to cartilage or bone.

RESOURCE LIST

Books

Tendon and Ligament Healing: A New Approach through Manual Therapy by William Weintraub; published by North Atlantic Books, Berkeley, California.

All-Around Fitness by Oliver Barteck; published by Könemann (Germany).
Gray's Anatomy by Henry Gray, F.R.S.; published by Barnes and Noble Books, New York.
Stretch and Strengthen by Judy Alter; published by Houghton Mifflin Company, Boston.

Web Resources:
American Academy of Orthopedic Surgeons: http://orthoinfo.aaos.org
U.S. Department of Health and Human Services National Institutes of Health: http://www.nih.gov

Editor's Note: Our Ph.D./CSCS reviewer also recommends the following resource for additional stretching exercises:

Essentials of Strength Training and Conditioning, 2nd ed., by Thomas R. Baechle and Roger Earle, eds.; published by Human Kinetics for the National Strength and Conditioning Association, Champaign, IL, ca. 2000.