Stretching The Dog

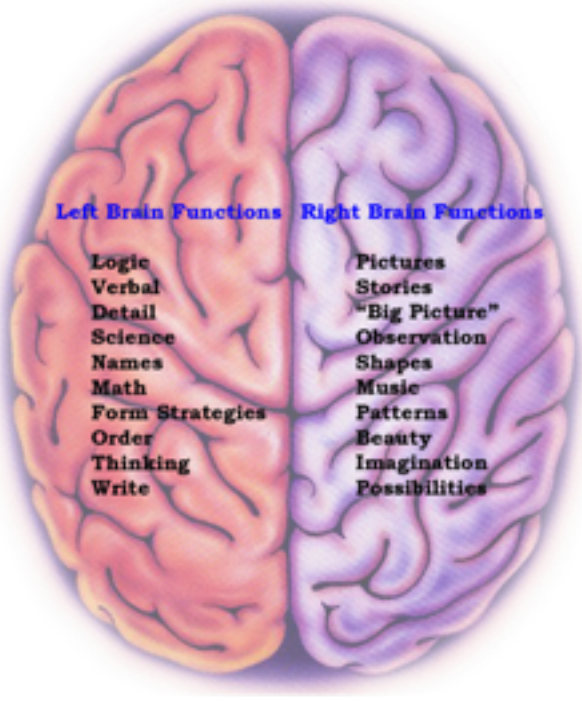
We generally do stretching at the end of a massage session after we have warmed the muscles up and relaxed the nervous system of the dog. Each animal will have a range of motion for each joint that is measured in degrees of movement. The movements that the joint can do are based by what type of joint it is. Ball and socket joints will move in all directions. Hinged joints will open and close (flex and extend). Gliding joints will allow flexion, extension, limited abduction and adduction and some gliding of the bones in relation to each other. Pivot joints rotate on one another. The range of motion of a joint is determined by the structure of the joint. Natural limits are placed on the joints by boney structures, ligaments, joint capsules and muscle tension. The range of motion of each joint kind be found here.

Causes of Limited Range of Motion

The range of motion of a joint can become limited in a variety of ways. Knowing why a joint has an unnatural limited range of motion is important. The methods we use to bring the range of motion back to it's natural movement will be determined by the cause of the limitation. A muscle can stay shortened by nervous system innervation that leads to muscle spasms. If nervous system over enervation is the causative factor then we need to relax the nervous system to get the muscles to go back to their natural resting length. Relaxing styles of massage will be most effective for this problem. Rhythmical rocking and rolling of the entire body, especially the limbs will relax the nervous system enough to allow us to move the joints through their entire range of motion. Trying to stretch an animal whose nervous system is engaged and limiting the range of motion will not succeed. Even if you do get some increase in the range of motion with other stretching techniques the nervous system will bring the limit back to its remembered, now habitual limited range of motion. Some massage therapist have been calling this "muscle memory" but the muscle has no brain or memory. The nervous system controls memories and responses to memories. If for example the dog has injured a muscle or a joint the natural response to painful stimulus is the withdrawal

response. There will also be varying degrees of inflammatory responses as well. A pain-spasm-pain cycle will be activated, if the tissue is injured, until the pain goes away and the withdrawal response or spasm has been attenuated. If the pain is short lived and of low amplitude, the nervous system will reset the withdrawal response and the range of motion will go back to normal. If however the pain amplitude was high and the pain became chronic the nervous system would try to dampen the continual pain signals by withdrawing it's awareness from the stimulus. Outgoing neuronal signals to the muscle spindles will be set to automatic pilot to help keep the tension in the muscle so that the joint remains stable and is aligned correctly. Effective tension would be the tension that maximally reduces the pain signals going to the brain. Once the nervous system has found this new norm the neuronal cells that are responsible for receiving the pain signal will produce a chemical response that will dampen the affect of the incoming pain signals. This adaptive response becomes chronic and reflexive even after the original trauma has healed. Every time the joint comes to the preset limit the proprioceptors send a signal to the brain and the brain reflexively responds by sending a signal to the muscle spindle to respond and cause the muscle to contract or withdraw before the pain signal gets triggered again.

Another cause of limited ROM is repetitive stress of the muscle and joint, brought on by repeated use of a specific muscle or muscle group. For instance if a dog is doing agility training and does a lot of weave pole activity we would expect that the muscles that are used will become over stressed and shortened to such a degree that they can pull the body out of alignment and cause undue stress on the joints. If you lifted a weight with one arm consistently and did not lift weight with the other arm, one arm would get bulkier, the muscle fibers in that arm would get shortened and the ROM of that joint would become limited. In humans we see a society that is right hand dominant. The left side of the brain controls the right side of the body and so in humans we have a left brain dominance pattern set up. The more we use one side of the body the stronger it becomes and the opposite side becomes weaker.



As the dominant side pulls the skeleton out of balance the weaker side must try and pull the body back into balance. This compensation generally happens in a segmental fashion. The compensatory adjustment of the vertebral column must be done gradually so that narrowing of the intervertebral spaces isn't to sharp and abrupt. Abrupt changes to the intervertebral spaces will compress the intervertebral disc. The disc will bulge out of the space and can compress the peripheral nerves as they exit the spinal column. This will cause pain, a withdrawal response and another compensatory structural adjustment. The nervous system tries to keep the center line of gravity in a straight line from the center of the head to the center of the sacrum and it works to keep and equal amount of weight on the cranial limbs and caudal limbs. Equilibrium must be maintained in both static and kinetic conformation or undue stress will be put on the joints and this in turn will cause a cascading set of adjustments that can end up putting stress on the intervertebral discs. If the stress is maintained over a long period of time misalignment of joints will cause wear and tear on the structures of the joint. The meniscus will start to degrade and fray in synovial joints, bones will rub against ligaments and damage the ligaments, bursa will become inflamed, bone will rub against bone and wear down. The synovial sack that covers synovial joints can become to strained and

develop small tears and synovial fluid will leak out. The synovial fluid lubricates and supplies nutrients to the joints cells. If to much synovial fluid leaks out, the joint space will lose lubrication and the joint will become dehydrated. Once the joint becomes dehydrated the bone will start to wear down the meniscus and meniscal tearing and fraying will occur. If this goes on for to long the meniscus will wear out completely and bone will start rubbing on bone. Arthritis will have set in at the beginning of this process. Arthritis can have a genetic, nutritional or structual etiology. Arthritis is inflammation of a joint. Arth-means joint and -itis means inflammation. The inflammatory response in arthritis will cause swelling in the joint, heat due to increased blood flow and will put pressure on the nerves due to the increased swelling. This will stimulate the nociceptors which in turn send a pain signal to the brain. The brain will respond by taking weight and thereby pressure off of the joint and the brain will then have to send signals to the muscles to bring the body back into balance. Dogs that have genetic structural problems are continually under stress. For instance dogs with patellar subluxation are always try to keep weight off of the knee that is affected and this will cause a patterned reflexive response to be set up by the brain to deal with this continuing issue. Patellar subluxation can be identified by the hop/skip steps done by dogs

at the affected caudal limb. Dogs with hip dysplasia are always trying to shift weight from the caudal limbs to the cranial limbs and from the affected side to the contralateral side. This puts additional stress on the joints that are now overloaded and those joints will become damaged over a period of time. Studying elderly dogs can show us how one structural problem can lead to many other structural problems as time goes on. Structural problems can lead to physiological problems as well. When pain signals are constant the entire nervous system gets stressed and it has a hard time maintaining homeostasis in the body. When vertebral misalignment occurs the narrowing of the intervertebral space, where the autonomic nerve roots exit, can become compressed and they can not get full nerve signal conduction to the organs of the body. The organs affected will not get full enervation and will not be able to function correctly. Mental depression will start to arise as the inescapable pain sets in and the dogs energy will become low. As time goes on the dog will not be able to exercise as much, which will in turn lead to weigh gain and lower energy. Lack of exercise will lead to lack of blood and lymph flow and the organs will become less vital. A slow downward spiral will continue on unless something is done to counter the causes of the pain. This is where you come in. Knowing how the structure can become out of balance and learning how to communicate this to the dogs

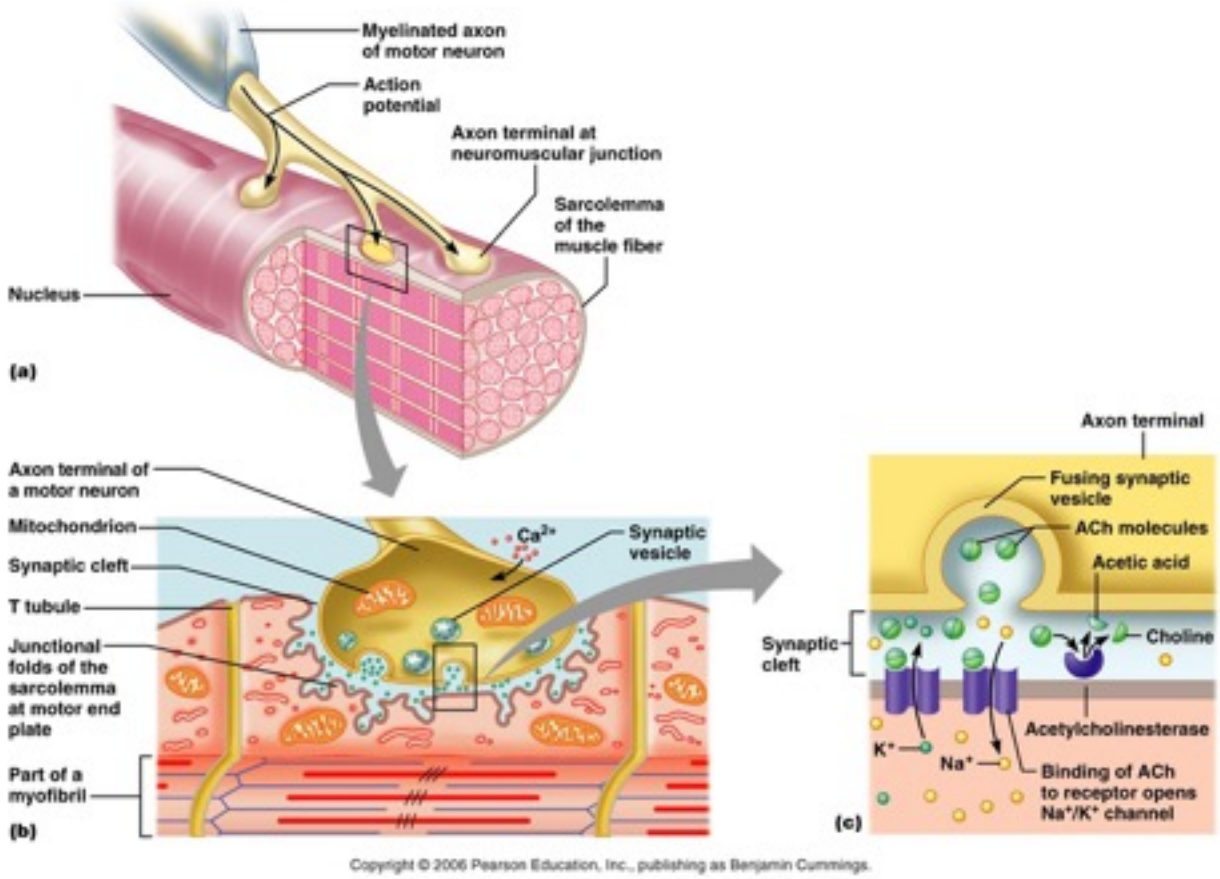
caretaker will help you motivate the caretaker to stretch and massage the dog themselves or have you come in to do this.
Other causes of structural imbalance are, trauma that has produced scar tissue that limits the ability of the muscle to come to normal full resting length or a limitation put in place artificially like a surgical plate, surgical pin or a surgically shortened musculotendinous unit. In these cases we will want to stretch very carefully and make sure not to go beyond the artificial limitation that has been put onto the joint.

Anatomy Essentials For Stretching

Nerve Anatomy

Knowing the anatomy of joints and connective tissue will help us to understand how each technique of stretching works. This in turn will help us to apply the techniques correctly. Knowing the anatomy and physiology of the dog will also help us determine the causes of the lack of ROM in a joint. Knowing the various causes of the lack of ROM of joints will help us know which techniques to use to improve the joint ROM.
Lets look at the nervous system anatomy first since the nervous system regulate muscle length and tension. The somatic nervous system (SMS) controls the

skeletal muscles of the body. Motor neurons originating in the brain run down the spinal column and exit through the transverse foramen of the vertebrae. These spinal nerves branch off and go to the muscles which they end up enervating when an action potential is initiated by the brain or by a reflex center in the spinal cord. This action potential depolarizes the muscle cells membrane. A patterned set of physiological processes are initiated that end up causing the muscle cell or group of muscle cells to contract.



If the nerve signal is not strong enough the muscle will enter into a twitch response phase that causes a muscle to spasm. Muscle spasms can lead to muscle cramping. Some of the possible causes of muscle spasms include:

- Poor blood circulation in the legs
- Overexertion of the muscle while exercising
- Insufficient stretching before exercising
- Exercising in the heat
- Muscle fatigue
- Dehydration
- Magnesium and/or potassium deficiency
- Calcium deficiency in pregnant bitches
- Malfunctioning nerves which could be caused by a spinal cord injury or a pinched nerve

The sensory part of the somatic nervous system is responsible for proprioception. Proprioception is an awareness of how the body is positioned in space and movement of the body. The proprioceptors are constantly working and sending signals to the integration centers of the brain and when necessary to reflex centers in the spinal column. The proprioceptors are:

- Muscle spindles
- Golgi tendon organ
- Joint kinesthetic receptors

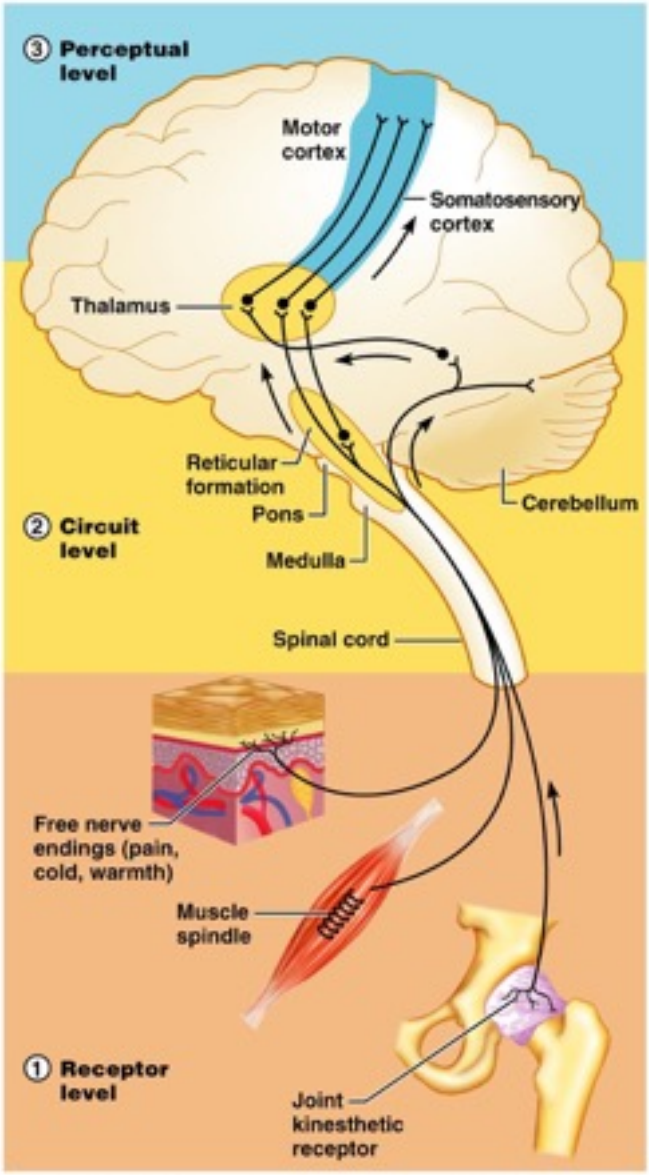
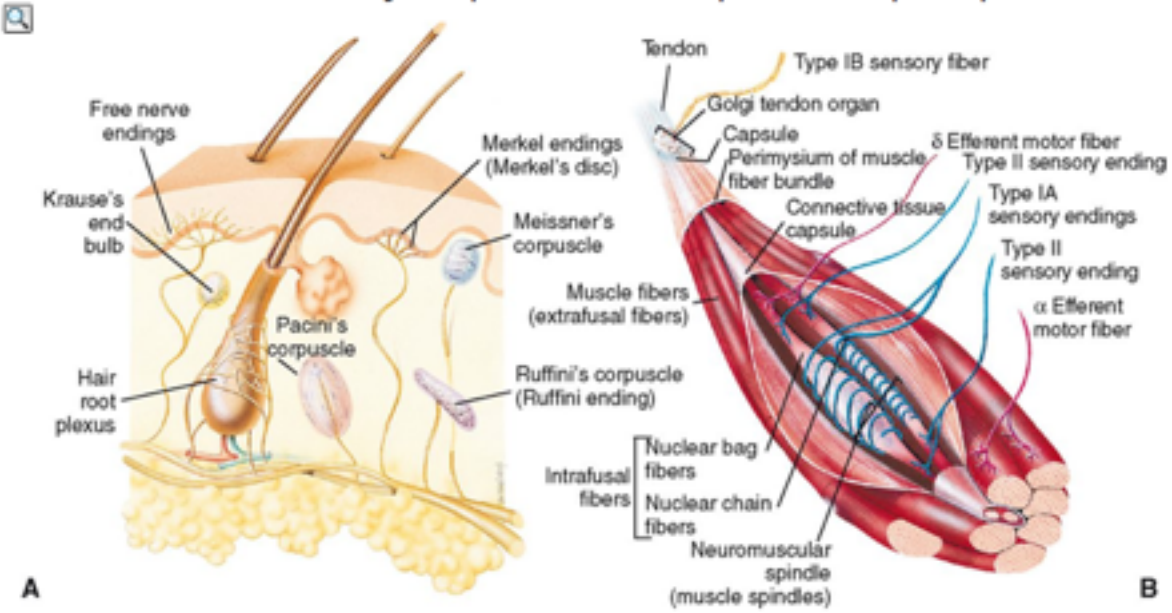


FIGURE 5-8 Somatic sensory receptors. **A**, Exteroceptors. **B**, Proprioceptors.



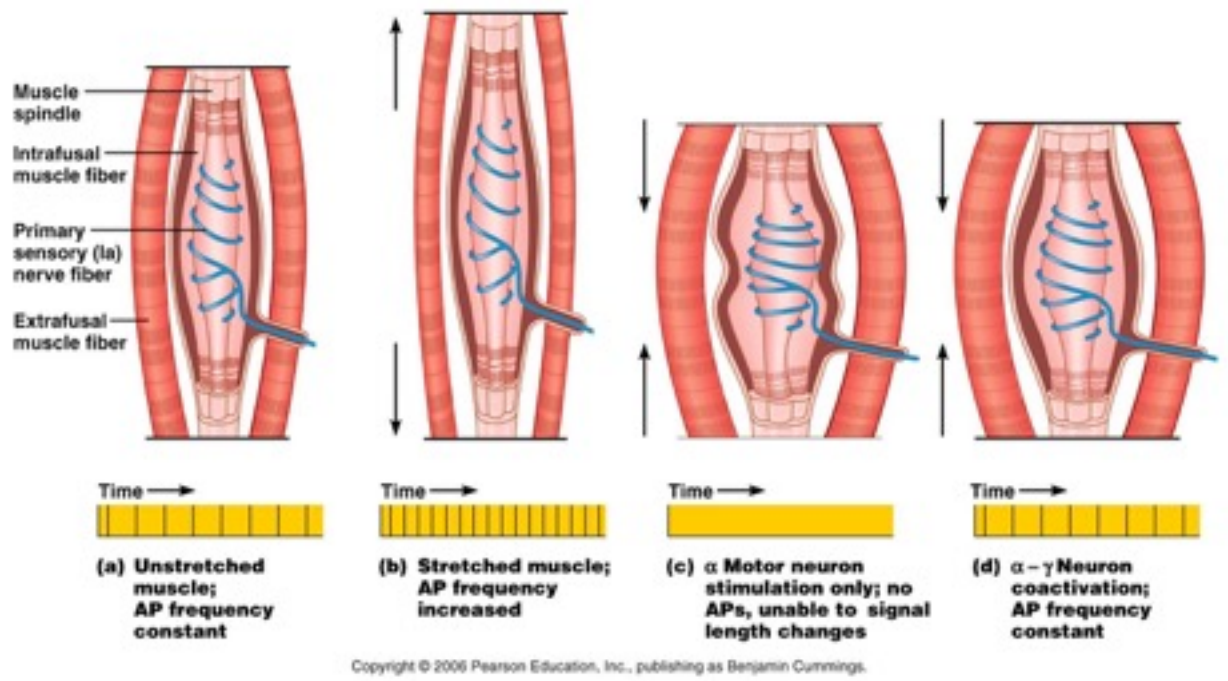
Each of the different structural classes of sensory receptors has a function. If you look at this chart you will see that the muscle spindles are mechanoreceptors that send muscle stretch and length information to the brain and spinal reflex areas.

TABLE 13.1 General Sensory Receptors Classified by Structure and Function (continued)

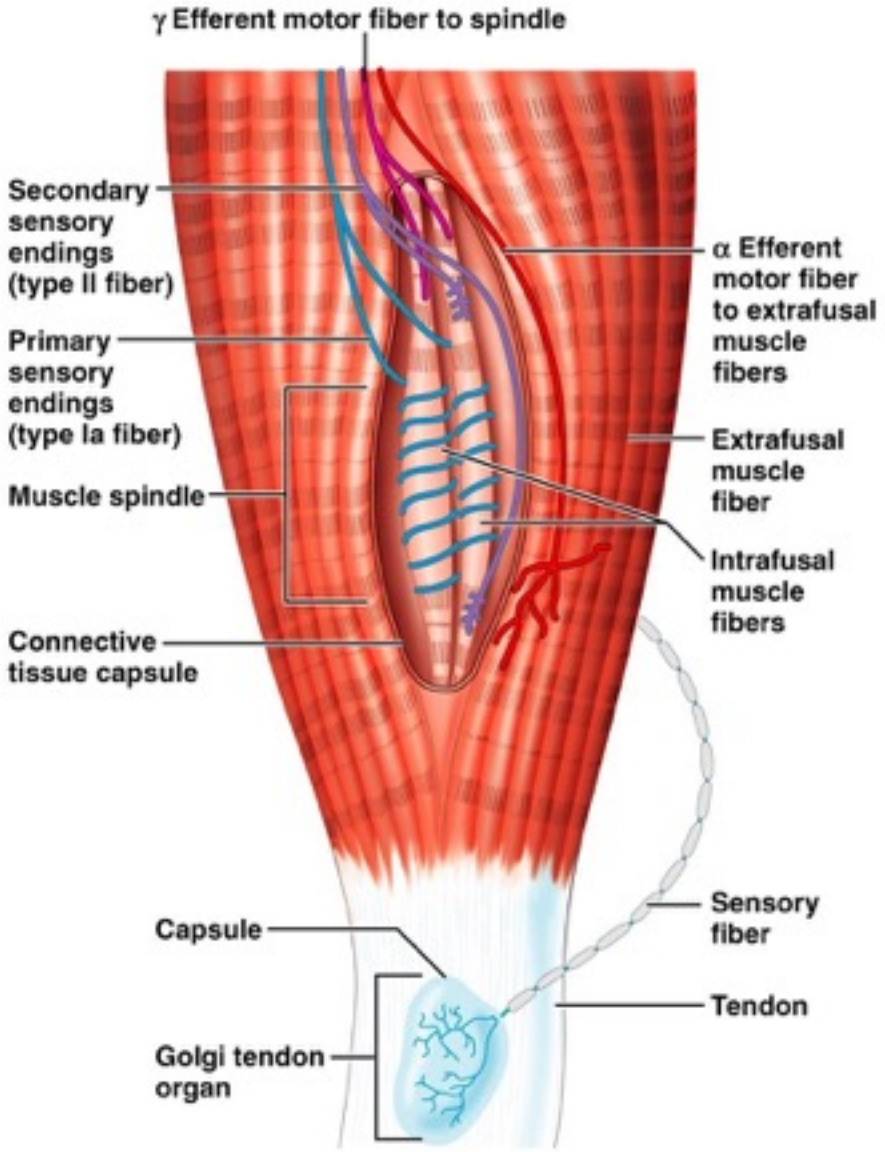
STRUCTURAL CLASS	ILLUSTRATION	FUNCTIONAL CLASSES ACCORDING TO LOCATION (L) AND STIMULUS TYPE (S)	BODY LOCATION
ENCAPSULATED			
Meissner's corpuscles (tactile corpuscles)		L: Exteroceptors S: Mechanoreceptors (light pressure, discriminative touch, vibration of low frequency); rapidly adapting	Dermal papillae of hairless skin, particularly nipples, external genitalia, fingertips, soles of feet, eyelids
Pacinian corpuscles (lamellated corpuscles)		L: Exteroceptors, interoceptors, and some proprioceptors S: Mechanoreceptors (deep pressure, stretch, vibration of high frequency); rapidly adapting	Dermis and hypodermis; periostea, mesentery, tendons, ligaments, joint capsules; most abundant on fingers, soles of feet, external genitalia, nipples
Ruffini endings		L: Exteroceptors and proprioceptors S: Mechanoreceptors (deep pressure and stretch); slowly or nonadapting	Deep in dermis, hypodermis, and joint capsules
Muscle spindles		L: Proprioceptors S: Mechanoreceptors (muscle stretch, length)	Skeletal muscles, particularly those of the extremities
Golgi tendon organs		L: Proprioceptors S: Mechanoreceptors (tendon stretch, tension)	Tendons
Joint kinesthetic receptors		L: Proprioceptors S: Mechanoreceptors and nociceptors	Joint capsules of synovial joints

The muscle spindles are located in the belly of the muscles and as the muscle lengthens or relaxes the intrafusal fibers which are sensory muscle fibers send a nerve impulse to the spinal cord and brain telling the control centers what length and load that muscle has. The extrafusal portion of the

muscle spindle receives motor signals from the motor section of the somatic nervous system and initiates a muscle contraction in response to chemical stimulation. This is important for us to know because there is a manipulation technique called **approximation** that takes advantage of this integration between the intrafusal and extrafusal muscle fibers.

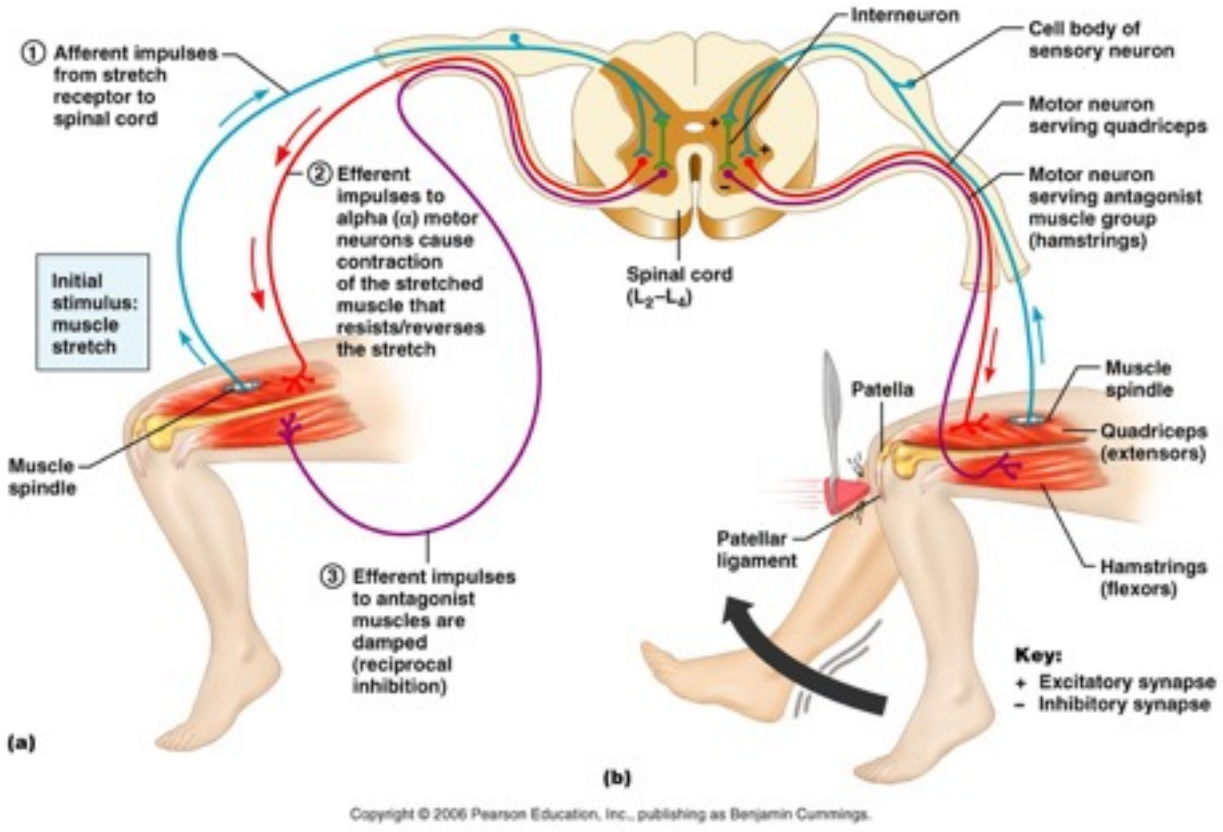


The golgi tendon organ is located in the tendon, close to the musculotendinous juncture. The musculotendinous juncture is the weakest part of the muscle/tendon unit and a common site of muscle strain and tears. The golgi tendon senses the amount of mechanical load on the tendon. If the load is becoming to great the golgi tendon



organ will relay a signal to the reflex areas of the spine and to the control centers of the brain and a motor response will trigger the opposing muscle to contract and take the load off of the tendon. When a high velocity load is sensed the golgi tendon signal will trigger a spinal reflex center response that will contract the opposing muscle

quickly to relieve the load. A crossed extensor and flexor reflex will also be triggered in the spinal column to maintain balance. The original signal will continue to the coordination areas of the brain and fine adjustments to balance will be made by the brain. We can also use this reflex response to help relax and stretch a muscle. This manipulation is call **reciprocal inhibition.**



The joint kinesthetic receptors are: pacinian corpuscles, free nerve endings and ruffini endings. These receptors sense the position, velocity, load, acceleration and chemical irritation of the joint. They are embedded in the synovial capsule of the

joint, the periosteum of the bone, the surrounding connective tissue of the joint, the tendons and ligaments of the joint. These receptors are always active even when the joint is at rest.

Muscle Anatomy

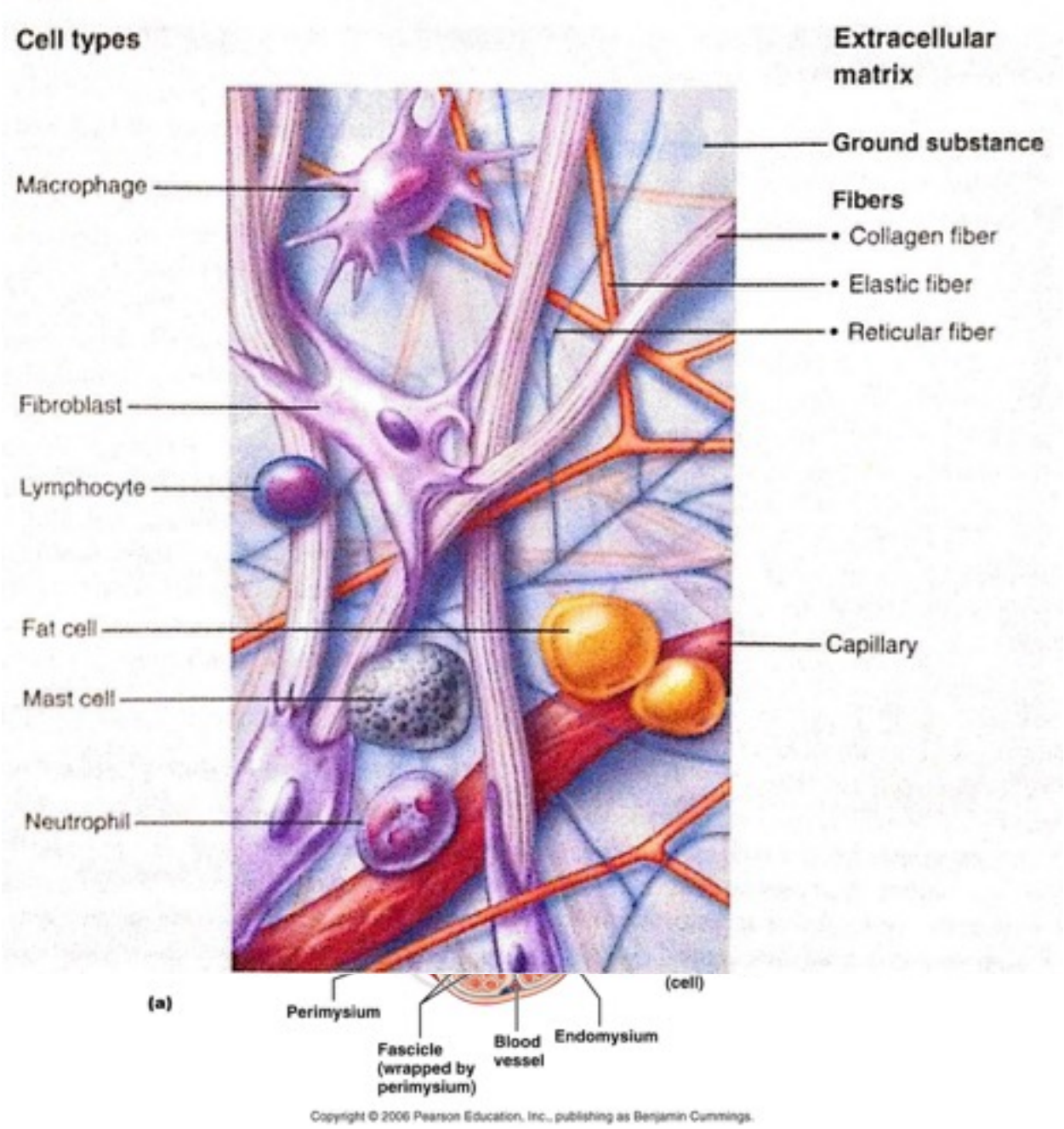
The muscles attach to the bones of the body and when they contract they move the bones to produce the various movements of the body. The contractile proteins of the skeletal muscle cells are the actin and myosin filaments. The muscle works on an all or non principal. When the muscle is contracting and the cross bridges are engaged the muscle can not relax and lengthen. Here is a video of muscle contraction that will help you understand the process. When the agonist is working the antagonist must relax or the contracting muscle will not be able to shorten and move. A signal is sent to the spinal column and brain to tell the opposing muscle to relax. We use this mechanism with **reciprocal inhibition.**

Connective Tissue Anatomy and Physiology

Connective tissue is ubiquitous. It is the supporting tissue for all structures of the body. It connects all cells of the body, anchors the cells and provides shape to the body. Blood is a kind of connective tissue, lymph,

bone, ligaments, tendons, cartilage, meniscus, periosteum, synovial capsules, intervertebral discs, bursa and every muscle is wrapped by connective tissue. The connective tissue provides strength and support. All nutrients and waste product of cellular metabolism must move through the connective tissue matrix. This chapter would become to big if we covered the all of the important information about connective tissue here. Since every muscle, nerve, bone cavity and organ of the body is covered by connective tissue, we will be working on connective tissue during stretching.

If we relax the nervous system through various massage techniques the muscles will return to their full resting length but the connective tissue surrounding the muscles and joints can still remain in a contracted or shortened state. The connective tissue responds to continuos imbalance by producing collagen fibers to brace and support the area in response to the stress that is being placed there. Collagen fibers are tough proteins that resist stress They cross link together to provide each other support through hydrogen bonds. Breaking these cross linked hydrogen bonds and taking the stress out of the connective tissue is one of our goals in stretching. After relaxing the nervous system we should lengthen to muscles to their resting link and then apply enough gentle, gradual, consistent and sustained force to break



the cross links and lengthen the collagen fibers. The longer we sustain the pressure on the connective tissue, the more the energy and heat will build up in the connective tissue. This heat and energy helps to break the hydrogen bonds and lengthen the collagen

fibers. We can accomplish this with **passive stretching**. We will cover connective tissue more thoroughly in the myofascial release class.

Stretching Techniques

We stretch the dog after we have done the massage. The best massage to relax the nervous system prior to the stretching is gentle shaking, rocking, rolling and gentle range of motion movements. Relaxing the nervous systems alleviates the shortening of the muscles caused by nervous system innervation. Stretching a muscle that is shortened by the nervous system without relaxing the nervous system is ineffective. The animals will also relax and trust you to do the stretches if you do a good massage before the stretch to disengage the sympathetic nervous system signals.
We should check the range of motion of the joints before we stretch the muscles that cross the joints we are working on. The range of motion and degrees of range of motion of each joint of the dog can be found here.

1. **Passive Stretching.** We do passive stretching by taking the muscle to it's full resting length as the dog relaxes. We stretch the muscle by supporting the joint of the limb we are trying

to stretch. We should always provide support to both sides of the joint we are stretching or we could apply too much force on the unsupported joint if we try to stretch from the end of the lever. The animal's joints are held together by ligaments, the joint capsule and the muscles that are crossing the joint. If any of these supports are week then we could damage the joint if we don't support it. When doing the stretch we take the muscle up to the limits of it's ability to lengthen (the end feel). Once we have come to this end feel point we do not try to force the muscle to lengthen because we could hurt the animal by over stretching them. We apply constant moderate pressure. We pause at this point and allow the animal to relax into the stretch. If they want to pull back we allow them to do so and gently go back into the stretch after they have relaxed. Do not try to apply more force then they are willing to allow or you will hurt them. When the dog relaxes with the stretch you will feel them let go and the muscle will lengthen even farther. Quite often you will see them breathe deeply before they let go. You can encourage them to breathe and relax by doing so yourself. Release the stretch after 10-30 seconds and repeat the stretch up to 10 times. The goal of

stretching is to provide length to the muscles, thereby promoting full range of motion to the joints, which the muscles work on. When the dog pulls back from a stretch several times this is a signal that there is some damage to a muscle or joint so only go to the border between relaxation and tension when this happens. This point may not be anywhere close to the full length of the muscle or ROM of the joint but if you rest at this point the dog will relax and allow you to slowly move to the resting length that is safe for them. Dogs will also let you know by looking at you when you are trying to stretch an area that has pain or they will push their nose against your hand to let you know. If you don't pay close attention while stretching the dog you could get bitten so pay close attention when stretching a dog or cat. When doing stretches on the dog, if they pull away from the stretch do less stretch for that muscle and make a mental note to watch the animal while they walk to see if they try to avoid loading the area that was sensitive to them. There may be an injured muscle or joint in this area. Have your vet check the area out the next time you see them.

2. **Active Isolated Stretching. (AIS)** With active forms of stretching we use a high value treat to get the dog to reach for the treat away from the muscle we need them to stretch. This works well on trunk and neck muscles. Peanut butter and cheese whiz work well. You will need to get a box of tongue depressors and some small paper cups. I personally don't like to use kibble or other treats that would require my hand to come into contact with the dogs mouth. Many dogs will accidentally bite you when trying to get the treat. A tongue depressor with some kind of nut butter works well. Make sure the dog is not allergic to nuts. If they are then use Cheeze Whiz or some healthy dog treat like this. Put the amount of treats you want to use in a paper cup so that you will not contaminate the main supply with the dogs saliva by scooping the treat out with a contaminated tongue depressor. We will need to let the dog sniff and maybe even taste the treat so that we pique their interest in the treat. We can then move the stick with the treat on it past their nose to a position that we want them to reach to. Have them reach for the treat and keep it just out of their reach for as long as possible. They will not hurt themselves by stretching to far but you can still

overstretch them by getting them to do too many repetitions. Using some nut butter or cheese spread on a tongue depressor and getting the animal to reach in the direction of the treat will get them to stretch further then you might be able to do with passive stretching. You will also get the opposing muscles to relax when they are doing the work. In order for a muscle to shorten/flex the opposing muscle must get a signal from the nervous system to relax. Repeat this type of stretch ten times if possible. You can also put a little peanut butter on their body so that they continue to lick the peanut butter off. Don't do this on long haired dogs because they will continue to lick the hair and this will cause the skin to get inflamed.

3. **Post Isometric Relaxation. (PIR)** We can also do post isometric relaxation techniques by having the dog reach for a treat while we resist the movement. We should try to get the dog to hold the flexion for ten seconds against our resistance. After ten seconds we should move the body part we are trying to stretch away from the direction that we were having them flex to. This type of stretch can be done on the trunk and neck muscles.

4. **Approximation.** Approximation is done by pushing the muscle fibers together toward the muscle spindle or away from the golgi tendon organ. We must do this manipulation with sufficient pressure to engage the proprioceptors. The steps to do this at the muscle spindle are:
   a. Place the target muscle in comfortable passive extension.
   b. Press the tissues together on the target muscle.
   c. Pull the tissues apart on the antagonist muscle.
   d. Lengthen the target muscle.
   e. Repeat steps b-d until the muscles normal resting length is obtained.
   To do this at the golgi tendon organ:
   a. Place the target muscle in comfortable passive extension.
   b. Pull apart on the tendon attachments of the target muscle.
   c. Push the tendon attachments together on the antagonist muscle.
   d. Lengthen the target muscle.
   e. Repeat steps b-d until full resting length of the muscle is obtained. Both of these methods work well with dogs who resist doing the other stretching techniques.

Cautions

When a muscle gets shortened through overuse, trauma, pain or boney misalignments the muscle will not work efficiently and over time habitual patterns that lead to postural misalignment can lead to pain and discomfort. This is especially true for older animals. Like humans, the older the animal gets the stiffer they get. This is due to past trauma, dehydration of the connective tissue fluids and lack of use. When stretching older animals we should use caution. Over stretching will damage the tissues and the animal will not want you to stretch them again. Keep the stretching sessions short and fun for older dogs. In older animals start the stretching later in the day when their muscles have warmed up and only stretch them once a week until you can see that they are not getting sore after the stretching sessions. Us hot packs on the muscles you want to stretch with an older dog if they can tolerate the heat. Using heat will bring blood flow to the muscles and will help to bring more pliability to the connective tissue. Generally heat is relaxing to the nervous system as well. If the dog has problems moving the next day and they stay immobile the next few days you know you have overdone the stretches so do less

stretching in the next session. With most dogs you can stretch them every other day and they will not get sore. If you have done yoga or stretching yourself you know how it feels after a good stretching session. You will feel a little sore the next few days sometimes.

For agility animals and working dogs stretching them before the event or work session will allow them to get the full contraction of the muscle, better endurance and more power. The longer the lever the more power and ground covering ability it has. A longer muscle can get more contraction and therefore more force it can put on the lever when it contracts maximally.

My personal feeling about post event or post work stretching is that it is best to let the muscles and nervous system rest and not work against a fired up nervous system.

Start with shorter sessions in the beginning and gradually build up the length of the session and the length of time that you or they hold each stretch.

If the dog has had a surgery on any joint then make sure to check with your vet and show them what stretches you are planning on doing. Get their approval first. If they have had an elbow or knee surgery the doctor might have put a limit on

the range of motion of the joint so don't over stretch that joint.
Don't stretch a strained or sprained muscle. Wait until the muscle is fully healed to stretch it and use caution.
Joints and muscles that have been badly damaged will have a lot of scar tissue and this scar tissue can play a useful role in stabilizing the joint and strengthening the muscle. Don't over stretch or over work areas that have scar tissue that is functioning to strengthen a joint or muscle.
One last caution before stretching. If the dog is limping, has just damaged a muscle, ligament or tendon or has strained a muscle you should not do stretching at all. This is one reason why I prefer not to stretch an animal post event. We are more likely to see an injury the next day then right after an event. Wait for the muscle to heal if there has been an injury. The length of time to wait would be determined by the extent of the injury and the animal's age. On a younger dog the muscle will heal quickly if the damage is not too extensive. On an older dog it might take a long time to heal the damage. Avoid stretching until the tissue is fully healed and then do slow, light stretching for short durations of time. Gradually build up the length of stretch and the duration of time you spend on stretching the damaged muscle. We generally want

to give strengthening exercises to complement the stretches that we are doing. If a building is leaning to one side we will need to pull it back into place and brace it to strengthen it so it doesn't get pulled out of place again. Stretching and strengthening go hand in hand. To much pull on a joint will pull it out of place and to little tension and support of the muscles that stabilize the joint will let it be easily dragged out of place by an opposing tight muscle. I generally like to have the dog lying down when stretching the limbs so they don't have to struggle to stay balanced. If you are stretching them while they are standing up make sure to have your body against them to provide some support.

Resources

If you are a professional veterinary massage therapist, a veterinary physical therapist, an agility dog trainer or just an involved animal caretaker then you might want to consider getting a set of Canine Rehab Exercise Cards from Canine Rehab Products. These cards are designed for and by veterinary physical therapists, are easy to understand and have great picture guides. There are both strengthening and stretching instructions in the set of cards. The Balance Equipment Exercise cards are excellent as well. For the

professional practitioner you will be able to share the cards with your clients and if you need some guidance from the vet you will be able to share the card with them and get recommendations for or against the particular stretch and directions for duration, frequency, and intensity of treatment. Students can find these cards here. OSOCM stud ents should watch the stretching at this link. Stud- ents should watch the Osteoarthritis and Strength ening videos before moving on to the next class.

-