Aging Process
Muscles, Bones, Tendons & Ligaments Script

Slide 2 Segment 1 Index

In the first segment we will be discussing

- Types of muscles
- Functions of skeletal muscle
- What is the role of muscles
- What happens to muscles with age
- Effects of loss of muscle mass
- How to build muscle mass

Slide 3 Types of muscles

You have muscles throughout your body, as you know and all of them have a different job to do. There are 3 types of muscles so let’s look at these a little more.

Heart muscle: this is responsible for making the heart pump. When you look at the heart you will see it is the middle layer of the heart. However, I am not going to talk about this today but will do when I start to look at the changes in the heart.

Smooth Muscle: this is what lines your blood vessels, lymphatic vessels, urinary bladder, male and female reproductive tracts, gastrointestinal tract, respiratory tract, and the iris of the eye. However, I am not going to go into this today either as I will talk more about them when I look at the various systems.

Skeletal Muscle: This is what I am going discuss in more depth today as you need to know how to be able to help your clients remain mobile, flexible and prevent them from having falls.

Slide 4 Functions of Skeletal Muscles

Skeletal Muscles have 4 main functions. They are

Excitability which means they can respond to stimuli ie. when something pierces or punches the muscle it will respond to the stimuli.

Contractibility which means it has the ability to get smaller or contract.

Extensibility which enables you to stretch and move so it gives you flexibility.

Elasticity which allows the muscles to return to its normal shape and size to also aid flexibility.

So as you can see muscles are really important for you to be able to move around. Their overall function is to produce force and cause motion so you can see that without muscles you are unable to shift around, move your body and be flexible nor would you move forward. Walk, run or jump. Muscles are in a constant state of contraction i.e. get shorter, and expansion i.e. get longer for you to be flexible and move around.

Have you ever been sitting in one position for a long time and when you get up to move around you experience some pain or discomfort when your muscles, tendons and ligaments start to move again?
Well this is because they have been in one position for an extended time so when you get up, they start to stretch and pull back when you start to move again.

This is why you have to be very careful when you are moving someone who has been sitting or lying in the once position for a long time. If you get them up to walk too quickly they may stumble and fall over. So it is so important to keep people mobile and moving around so they don’t fall over. Balance is also affected when people are left to sit or lie down for long periods too so keeping people mobile is extremely important.

You also need to be very gentle with people who are not mobile or spend a lot of time in their bed or sitting in a chair. Their muscles and tendons will contract, which is where the work contracture comes from, and when you try to move their limbs you can’t move them. This is very painful for the person. You can see more on this on the topic Pain Identification and Management

**Slide 5 What is the role of muscles?**

Muscles also have 4 important roles to.

The first is **PRODUCING MOVEMENT**: this happens when the muscles contract and expand and return to normal when you walk, run, sit – in fact any time you move which we talked about earlier.

The second role is to **MAINTAIN POSTURE**: You probably don’t even notice what your muscles are doing to help you stand upright and maintain body posture. The muscles are moving continuously, making one tiny adjustment after another so that you can stand up tall, sit down, walk or whatever movement you make even though there is a never-ending downward pull of gravity.

The third important role of muscles is in **STABILIZING JOINTS**. This happens automatically when your muscles pull on your bones to cause movement. They make your joints strong by keeping your joints steady i.e. stabilized, as you will see in joints like your shoulder

The forth important role is in **GENERATING BODY HEAT**. This happens in muscle activity. When you move around your muscles contract and extend. Nearly ¾ of the body’s energy escapes as heat. This heat is really important to help maintain normal body temperature. When you consider that skeletal muscle makes up at least 40per cent of body mass, you can see why it is responsible for heat generation.

**Slide 6 What happens to muscles with age?**

So what happens to your muscles as you get older?

Well by the age of 30 your lean muscle mass is starting to reduce. From the age of 40 you can expect to lose between 0.5 to 2% of lean muscle mass every year with an average of 1% loss per year. The number and size of muscle fibres diminish as well and it appears that routine replacement cannot keep up with the destruction or damage that occurs in the body. However research has discovered that a minimum of 3 exercise sessions a week can increase the blood flow and restore them a similar level as younger people and can reverse muscle wasting.
There is no doubt that many younger people do a lot more exercise than their older counterparts but as you get older, exercise is really important to help maintain lean muscle mass. The key to this is to ensure a good blood flows to the limbs especially the legs.

**Slide 7 What muscles look like with age?**

You can see in this slide how people lose muscle mass with age. What is important to know is it is very easy to lose muscle mass and once you’ve lost it, it is very hard to build up again. So you are the masters of your own destiny. Use it or lose it. This is yet another reason why you should help to keep the clients/residents in your care active and moving within their limitations and why you should make sure you keep active throughout your life.

**Slide 8 Effects of loss of muscle**

So what are the effects of loss of muscle mass? Well as you slow down, your muscles do not respond so well. This is probably because there is a reduced blood supply through in activity. While it is natural to slow down with age and muscle mass loss is inevitable, choosing a lifestyle that is sedentary, which means not being active, just sitting around, will speed up the loss of muscle mass.

**Slide 9 How to build muscle mass**

So just how do you build up muscle mass? In the last slide I told you what makes you lose muscle mass so what you have to do to build up muscle mass is exercise. So walking your clients to the toilet, dining room or outside to look at the gardens is essential to have good healthy muscles. I know they can be slow to walk and get to a meal or the toilet and you have others to take care of as well but you must consider what is best for the person. Putting a person in a wheelchair unnecessarily has little or no benefits for the clients. Keeping yourself and your clients or residents active is vital to good health.

**Segment 2 Slide 1 – Ligaments index**

You have probably heard of ligaments but what actually are they and how do they differ from tendons. Well this segment will deal only with ligaments so you have a good understanding of what they are, and the job they do. So in this segment we will discuss ligaments and what happens to them with age.

**Slide 2 What are ligaments**

Ligaments are the tough, elastic fibrous material that connects bone to bone. They give strength to the joint to keep the joint stable so that you cannot bend your elbow right back and keeps your bones in alignment.

These fibres which are made of collagen that is arranged in a crossing fashion over the joint. While your muscles flex on exercise, ligament actually don’t. Although ligaments are slightly flexible their main role is to hold the joint in place. So if you overstretch your ligaments the joint will become weaker as the supporting structures are just not as strong to be able to do its job and the joint becomes weak.
Slide 3 What happens to ligaments with age?

So what happens to these ligaments as you get older? Well they lose their flexibility through the loss of elasticity which is why it is harder to get up and down out of a chair or to get up off the floor as you get older. Children just jump up and around because they have so much elasticity in their ligaments but this goes with age and getting up off the floor is a major exercise. So if a person is on the floor, slips or falls, they often have to get over on to their knees and pull themselves up on a chair or some other object.

You may have heard of an older person living on their own having a fall who have remained on the floor for a considerable period of time because they just cannot get themselves up. Often it is not until a neighbor notices they haven’t seen them around or their curtains may not be drawn in the morning, or something similar that people are alerted to the fact that something may have happened to them.

Segment 3 Slide 1 Tendons Index

Like ligaments, tendons have an important job to do so now we will look at the Slide 13 what tendons are, what happens to them with age, what the result of this is, and common tendon problems and how to maintain healthy tendons.

Slide 2 What are tendons?

Where ligaments connect bone to bone, tendons connect muscles to bones. Where ligaments cross across the bone, tendons are parallel bundles that are attached to the muscles and bone. These are not that elastic but they are flexible which means they don’t stretch but put tension on the muscle to allow the muscle to stretch. Tendons concentrate the pull of the muscle on a small section of the bone and allow the muscle to work. They act like a spring and control the muscle on movement and provides additional stability when at rest. For example when we walk, the Achilles tendon in our foot moves to accommodate movement i.e. as we step out, the tendon lengthens and allow the muscle to work without putting strain on it and when we stop walking the tendon goes back to its normal inactive state.

Now there are hundreds of tendons throughout the body. Some are very small like in our fingers, and some are very big like Achilles tendon in our foot. You may have heard of a sports person snapping their Achilles tendon. This is where too much tension is put on the tendon and when it can’t take anymore, it just snaps and come away from the bone. These people require surgery and are in a cast and on crutches till it heals.

On the other hand, the rotator cuff tendon in your shoulder can tear or become excessively strained when the arm is over extended. While some people require surgery for this, many require physiotherapy sessions to put it right. This is one of the most common injuries for an older person and is why you should never pull a person up by the hands and over stretch their arms as this extra tension could damage the tendon. Likewise a person who has had a stroke and may be paralyzed down one side needs to take particular care and have the arm supported so they don’t damage the rotator cuff and cause further damage or injury.
Slide 3 What happens to tendons with age?

So what happens to tendons with age? Well firstly the water content reduces and therefore the tendons become less flexible and stiff.

Slide 4 Results of tendon changes

Because of this inflexibility, things like hand grips decrease so a person may not be able to hold on to your hands or a rail to pull themselves up. This is why they need your help when pulling themselves up. You should use a lifting belt to do this and not put extra tension on their shoulder. If you don’t know have any lifting belts or don’t know how to use one, ask your Registered Nurse or physiotherapist to show you how to get a person up out of a chair or sit them up in bed.

Also a person loses the ability to do fine motor skills or tasks. E.g a lady may have done needle work for many years but as her tendons have lost their flexibility she is no longer able to hold onto a needle or the needle work cloth. A person may have been a great artist but can no longer manage to hold a paintbrush with sufficient strength to paint any more or maybe a man may have done all the handiwork around the house using hammer, nails and screwdrivers but can no longer hold onto the them very well so they fall out of his hands. On top of this he may not have the strength the turn the screwdriver.

Watch the people in your care and see how they manage to use their fine motor skills. Some may not be even able to hold a knife and fork anymore. You need to be observant all the time and see what aids and appliances may be used to help them maintain their independence. You do not need to do everything for them but assist them to be independent to the level they are capable of.

Always put yourself in the other person position. How would you feel if you were not assisted to hold on to a knife, fork or spoon and someone just comes along and does it for you.

Slide 5 Aging differences

You can see in this slide just how different an older persons hand is from a child’s hand so it is understandable why they may have trouble doing some basic tasks. It is pretty obvious when you look at these two hands.

Slide 6 Common tendon problems

Tendonitis or probably more correctly called tendonopathy, is the most common tendon problem you will come across. You may have experienced it yourself. It is characterized by pain over the tendon area which restricts movement. There is usually swelling over the tendon too.

It occurs when the tendon has been over stretched past its normal range of movement. While you may or may not experience pain immediately, pain will gradually increase over time so it is important to report it to the registered nurse immediately the person tells you they have pain or you notice a change in their behaviour when you are doing any cares. The person needs to be seen by the doctor early and treatment started and help relieve the pain for the person.

The most common areas affected are the shoulder, elbow, knee or heel.
For an older person the shoulder, or rotator cuff as it is called is the most common tendon affected. This is why you must never pull a person up out of a chair by their arms outstretched or walk them along the corridor pulling their arms as it can over stretch the tendon. Shoulder tendon injury is very painful and if a person cannot tell you where the pain is you could be causing them a lot of distress. It may even result in them hitting out at you if they cannot explain to you what and where the pain is.

People severely at risk those who have had a stroke and one of their arms is paralysed. This is why their arm may be supported in a sling and why you need to make sure it is supported across their body while sitting in a chair.

Also never leave an arm hanging over the side of the chair or the side of the bed either. This could result in the person suffering tendon problems.

While the shoulder is the most common tendon affected, the elbow or knee could also be damaged. Knee tendon problems are also common in sports people. Knee tendon problems are also common in sports people but can also occur when any person has a fall where the tendon has been overstretched. This can happen to older people in your care too so it is important to keep people mobile so they are not at risk of falling and damaging not only their bones but tendons as well.

Sometimes the tendon can rupture and pull completely away from the bone. This requires surgery.

**Slide 7 How to maintain strong tendons?**

So what can you do to maintain strong tendons?

Keeping tendons healthy and strong is done by keeping active and not overstretching them. If you don’t keep the tendons flexible they will be more susceptible to injury. Some people like to take a supplement called glucosamine, which the body does produce naturally but it is thought to decline with age.

So you need to avoid tendon injuries because once they happen in older people they take longer to heal. Tendons don’t have a lot of stretch as I said earlier but the elderly have much less due to the reduced water content in their tendons,

So what sort of exercises should you do or should older people do?

Well one of the most effective gentle series of exercise is Tai Chi. It keeps people mobile and helps with their balance also which makes them less at risk of falling and getting fractures. Yoga is another very good exercise too. So in order to maintain strong tendons you must maintain flexibility and you can only do this through exercise.

**Segment 4 Slide 1 Cartilage Index**

In this slide we will discuss Cartilage. I am sure that you have heard of this word but what is it actually and what is its job? We will also look at types of cartilage and how to maintain healthy cartilage.

**Slide 2 What is cartilage?**
Cartilage is connective tissue made up of collagen, sugar and proteins. It cushions the joint but unfortunately as people get older it converts to bone which contributes to joint stiffness. It provides structure and support to the body's other tissues without being as hard or rigid as bone. Cartilage is usually flexible, depending on the type of cartilage and where it is situated. Some of the bodily structures that include cartilage are the ears, nose, ribcage, and intervertebral discs. Cartilage doesn’t have a blood supply so if damaged it is slow to heal or may not be able to heal itself.

Slide 3 Types of Cartilage

There are 3 different types of cartilage and they each do a different job. Firstly there is

**Hyaline Cartilage** – This is a slimy mass but it has a firm consistency. This is the most abundant cartilage in the body and undergoes a lot of change with age. It doesn’t contain any nerves or blood vessels so it is a fairly simple structure. It provides a smooth surface enabling surfaces to slide over each other. This is found in the end of long bones like the leg and arm bones, the sternum or breast bone, ribs and the respiratory system.

Next there is **Elastic Cartilage** – which is sometimes called yellow cartilage. The outer ear is made up of elastic cartilage as is the epiglottis, the flap that guards the larynx and stops food from going into the lungs. It provides support to surrounding structures and helps to define and maintain the shape of the area in which it is present, e.g. the external ear. So as you can see this cartilage needs to be flexible but we are not going to talk about this cartilage here.

Finally there is **Fibrocartilage** – This is a tough but flexible and very durable cartilage that is found in the spine and pelvis and inside the knee. It provides support and rigidity to attached/surrounding structures and is the strongest of the three types of cartilage. It is made up of collagen and is found in places where flexibility or movement is needed. However when these joints get overstretched the cartilage can tear or bulge out of the joint. Surgery is usually required to repair this injury.

Slide 4 What happens to cartilage with age?

So what happens to cartilage as you age? Well it begins to break down. Just like our skin gets dry as we age, so does the water substance in our cartilage, called the synovial fluid, reduces and the joints essentially become dry. This means that eventually bone will rub on bone. This can make movement very painful and conditions like osteoarthritis occur. You can see on this slide how a normal healthy joint and an unhealthy knee joint looks like when the cartilage has worn away. It is easy to understand why it may become painful to walk. This can happen to other joints to so you need to be aware of this and make sure these people do not put up with pain. As I said in the pain topic, you must never withhold pain relief. It takes a long time to get a person out of pain so it is better to keep them pain free.

Some people with severe osteoarthritis may have a hip or knee replacement however many of the people in your care are not good candidates for surgery so you need to keep them free of pain.

Slide 5 How to maintain healthy cartilage

So just how do you maintain healthy cartilage?
Well it is the same as for everything. You need to keep moving so exercise is important. You also need to keep hydrated that is make sure you drink plenty of water. If you have done the hydration topic, you will know how important water is to the body. Every cell in your body requires water. Diet is also important. Healthy joints require certain nutrients which you get from your food so you see we are back again with the importance of the basics of good health. A diet that includes good sources of vitamins, minerals, protein, carbohydrate and good fat and lots of water will help both you and your clients to keep mobile.

Segment 5 Slide 1 Bones Index

In this segment we will look at what happen to bone with age, what the aging bone looks like, bone density and why it is important, what is lipping of bone and how to maintain good healthy bones

Slide 2 Bone changes

Because the calcium level declines or reduces bones become more fragile. You can see on the pictures what they look like. It becomes more porous and the holes in the honeycomb or lace like affect in the bone, become larger so it is easy to see why bones become more brittle as you age and why you are more at risk of fractures. This is why it is so important to support and help people when they are walking and to keep them mobile.

Even the bones in your face change. Your eye sockets will get bigger and the angle of the bones beneath our eyebrows get smaller. This may contribute to the formation of frown lines on your foreheads, "crow's feet" at the corners of our eyes and droopy lower eyelids. The angles of the brow, nose, and upper jaw bones also change and the length and height of the lower jaw decreases as well. If you remember the picture on the very first slide on how a male’s face changes with age you can see the changes that occur. So if you are thinking about plastic surgery, be aware that you may be able to change the skin on the outside but you cannot change the bone that the skin covers.

Slide 3 Bone Density Loss

So you know that your bones will lose calcium which is why many older people are on calcium supplements. However some people may get a condition called osteoporosis. Everyone starts to lose bone density from around the age of 35 years. It is a gradual process of around 1-2% per year so you don’t really notice it. However when women go through menopause, their bone loss increases to 4-5% per year for 10 years prior to and after menopause then it returns to 1-2% bone loss per year. So the earlier a women goes through menopause and stops producing estrogen, the female hormone, the more at risk she is of getting osteoporosis.

Bone loss in men continues steadily at 1-2% per year so you can see why women are more at risk of osteoporosis. However men can suffer from osteoporosis too.

Slide 4 Posture and gait changes

With the loss of calcium and bone density, your posture, the way you stand or hold yourself and your gait, the way you walk, will change also. If you look at this slide you can see what typically happens to a person as they age. The posture may become more stooped (bent) and the knees and hips more flexed. The neck may become tilted, and the shoulders may narrow while the pelvis becomes wider.
Movement slows and you cannot walk as fast as you used to and you may also find movement is restricted or limited due to the joint, muscle, cartilage and ligament changes as well. Your walking pattern or what is known as your gait becomes slower and shorter and you may find walking a little more difficult. You may also become unsteady on your feed. You will probably swing your arms less too. Older people often tire more easily, and have reduced energy levels. So you need to take this into account when you are looking after an older person. It is easy to see why the gait changes when you look at the picture on the left showing the posture from a young person standing upright through to an older person who has become very stooped.

You can also see what happens to the spine of the ladies on the right. This is a normal process and affects some people more than others but it does explain why the people in your care have difficulty walking and need your assistance.

**Slide 5 Lipping of bone**

Lipping of the bone can also occur in any joint. This is where there is an overgrowth of bone in the joints. It is called a degenerative or progressive condition that affects the joints. It is usually the result of wear and tear around the cartilage and the body cannot replace the cartilage. This causes bone to rub on bone and as you can imagine it can be very painful.

**Slide 6 How to maintain healthy bones?**

It is really important to look after your bones. So what can you do? The simple things are to exercise. This is doing anything that creates resistance so it can include walking, running, weight’s, playing sports likes badminton or tennis, and doing Tai chi or Yoga in fact anything that keeps you moving.

While you cannot change any of your residents who have not kept up an exercise regime, you can at least help to keep them mobile and help to maintain good bone density.

Diet is also very important. It needs to be high in calcium While dairy products, milk, cheese and yoghurt are the obvious foods rich in calcium, Salmon, Tofu, Rhubarb, Sardines, White and baked beans, Broccoli, Peas, Brussel sprouts, Sesame seeds, Bok choy, Almonds and Spinach are also rich sources of calcium. So it is not only important for you to have a diet high in calcium, you need to take note of what your clients/residents are eating and record and report when they are not eating well. For more information on diet do the Nutrition Topic.

Alcohol and smoking also contribute to bone loss. There is undisputed evidence that excess alcohol consumption and smoke affects good health. So if you want to live a long and healthy life, you need to be aware of what you are putting into your body and noting how much exercise you do. It is no good saying I wish I had done more exercise when you have lost your mobility. It is way too late.