DOWNLOAD PDF MUSCLES, BONES, AND BODY MOVEMENT

Chapter 1 : Bones, Muscles, and Joints

These muscles hold the skeleton together, give the body shape, and help it with everyday movements (they are known as voluntary muscles because you can control their movement). They can contract (shorten or tighten) quickly and powerfully, but they tire easily and have to rest between workouts.

Next Every time you move your body from place to place, your bones, muscles, and joints are working together. The bones that make up your skeletal system provide shape and protection. Your skull protects your brain, your backbones protect your spinal cord, and your ribs protect your heart and lungs. Wherever two bones meet, there is a joint to hold them together and allow them to move, but there would be no movement without the muscles that make up your muscular system. Your Muscular System Muscles are attached to bones by strong cords called tendons. You can feel the biggest tendon in your body â€" the Achilles tendon â€" by touching the back of your heel, where it attaches to your ankle bones. In addition to the skeletal muscles that contract to move your bones, you also have smooth muscles that are responsible for keeping your digestive system moving and your blood flowing. Common Muscle Problems The most common problems with muscles are the aches and pains of daily use. Overuse of a muscle can cause soreness, and extreme overuse can result in a muscle strain or tear. Muscle aches can also be caused by nervous tension or fever. Muscle cramps â€" involuntary and painful muscle contractions â€" are a common problem in the leg muscles. Cramps usually occur when you overwork a muscle, especially if you are dehydrated. The best way to get rid of a muscle cramp is to stretch out the muscle. Muscle Diseases Muscular dystrophy, a group of inherited muscular diseases that can affect people at birth or develop later in life, causes progressive muscle weakness. Inflammatory myopathy encompasses another group of muscle diseases that cause progressive muscle weakness. These diseases include polymyositis and dermatomyositis. Myopathies can be caused by allergic reactions, infections, reactions to medications, or by an autoimmune reaction. Your Skeletal System There are bones in the skeletal system of an adult. But when the skeleton initially forms in the body of a fetus, it is made of soft cartilage, not bone. Eventually the cartilage is replaced by hard calcium. The process is called ossification, and it takes about 20 years to complete. Bone building continues throughout your life because bones are a living part of your body. The soft insides of your bones are also important: Your bone marrow makes red blood cells, white blood cells , and platelets, all of which have important functions in the body. Common Bone Problems One of the most common problems with bones is that they can crack or break. When a bone breaks completely, such as from a fall or some other trauma, it may need to be realigned for proper healing. When a bone breaks and pushes through your skin, the break is called a compound fracture. One of the most common causes of fractures in older people is osteoporosis. This weakening of bones is very common in both sexes, but more so in older women. In fact, more than 50 percent of women over age 50 will eventually suffer a bone fracture due to osteoporosis. Other bone diseases can be caused by bacterial infections, usually after a bone injury. The most common bacteria is Staphylococcus aureus, and the infection is called osteomyelitis. Bone cancers may form at any age. The most common type of primary bone tumor in young people is called osteosarcoma shown at left. Your Joints The joints are the moving parts of your skeletal system. The main joints in the body, called the synovial joints, are filled with a lubricating liquid called synovial fluid. The ends of your bones, where movement occurs, are protected by a lining of smooth cartilage shown in pink at left that allows movement without bone grating on bone. Tendons shown in white at left attach muscles to the joints. Hinge joints, like the joints in your knees and elbows, allow movement in only one direction. Pivot joints, such as the joint at the top of your spine, allow twisting and rotating motion, and the ball-and-socket joints of your hips and shoulders allow the fullest range of motion. Arthritis Arthritis â€" basically, pain and swelling of the joints â€" is the most common cause of disability in the United States. There are over different types of arthritis, but the most common is osteoarthritis, which is caused by gradual wear and tear due to aging and injury. Rheumatoid arthritis is an autoimmune disease in which your immune system attacks your joints and causes inflammation. Juvenile arthritis is a type of rheumatoid arthritis that occurs in children. Gout and fibromyalgia are also types of arthritis. Foot Pain Because your feet act as shock

absorbers and support all your weight, muscle, joint, and bone, foot problems are not unusual. In fact, about 75 percent of people will complain about foot pain at some time in their lives. Some common foot problems include bunions a bump at the bottom of your big toe , stress fractures a thin crack in a toe, ankle, or foot bone , inflammation of the Achilles tendon which connects the calf muscles to the heel bone , flat feet also called fallen arches , and heel spurs an abnormal growth of bone under the heel. Hand Pain Like your feet, your hands and wrists have many bones, joints, and muscles that are constantly working together. Osteoarthritis of the hands is very common, and people with osteoarthritis often develop pain in multiple joints. Rheumatoid arthritis of the hand or wrist can cause deformity and loss of hand function. Because rheumatoid arthritis usually affects both sides of the body, it can cause problems in both hands. Back Pain Your back and neck are the areas where you are most likely to experience bone, joint, or muscle problems. According to the National Pain Foundation, back and neck pain are the most common causes of chronic pain. Pain can be caused by issues with bones, muscles, joints, or a combination of factors. Pain might start because of a sprain or a strain, but arthritis, too, can affect the joints of your spine. Some treatments for back pain include pain medications, muscle relaxants, physical therapy, and surgery. Hip and Knee Pain Hip pain is a common problem, especially among those age 65 and over. It can be caused by injury to the hip or another part of the body or by overuse; arthritis; bursitis; or infection. Hip pain treatments include medications, physical therapy, rest, or surgery such as hip replacement. According to the U. Centers for Disease Control and Prevention, more than , hip replacement procedures are done each year in the United States. Knees are the joints most susceptible to pain. Like hip pain , knee pain is also more common as we age, often as a result of osteoarthritis, obesity , inactivity, or overuse. Treatments for knee pain include rest, medications, or arthroscopic knee surgery.

Chapter 2 : How Do Muscles Move the Body's Skeleton? | calendrierdelascience.com

There are over muscles in the human body. Learning the muscular system often involves memorizing details about each muscle, like where a muscle attaches to bones and how a muscle helps move a joint.

Flexion Extension The muscles tibialis anterior and tibialis posterior invert the foot. Some sources also state that the triceps surae and extensor hallucis longus invert. The muscles involved in this include Fibularis longus and fibularis brevis , which are innervated by the superficial fibular nerve. Some sources also state that the fibularis tertius everts. The muscles involved include those of the Anterior compartment of leg , specifically tibialis anterior muscle , extensor hallucis longus muscle , extensor digitorum longus muscle , and peroneus tertius. The range of motion for dorsiflexion indicated in the literature varies from Plantarflexion of the foot: Primary muscles for plantar flexion are situated in the Posterior compartment of leg , namely the superficial Gastrocnemius , Soleus and Plantaris only weak participation , and the deep muscles Flexor hallucis longus , Flexor digitorum longus and Tibialis posterior. Muscles in the Lateral compartment of leg also weakly participate, namely the Fibularis longus and Fibularis brevis muscles. Those in the lateral compartment only have weak participation in plantar flexion though. The nerves are primarily from the sacral spinal cord roots S1 and S2. Compression of S1 roots may result in weakness in plantarflexion; these nerves run from the lower back to the bottom of the foot. This corresponds to a counterclockwise twist for the right forearm and a clockwise twist for the left when viewed superiorly. In the forearm, this action is performed by pronator quadratus and pronator teres muscle. For the foot, pronation will cause the sole of the foot to face more laterally than when standing in the anatomical position. Pronation of the foot is a compound movement that combines abduction , eversion , and dorsiflexion. Regarding posture, a pronated foot is one in which the heel bone angles inward and the arch tends to collapse. Pronation is the motion of the inner and outer ball of the foot with the heel bone. It flattens the arch as the foot strikes the ground in order to absorb shock when the heel hits the ground, and to assist in balance during mid-stance. If habits develop, this action can lead to foot pain as well as knee pain, shin splints , achilles tendinitis , posterior tibial tendinitis, piriformis syndrome , and plantar fasciitis.

Chapter 3 : Movements,role of Muscles and Bones in Movement | calendrierdelascience.com

The musculoskeletal system provides form, support, stability, and movement to the body. It is made up of the bones of the skeleton, muscles, cartilage, [2] tendons, ligaments, joints, and other connective tissue that supports and binds tissues and organs together.

From our head to our toes, our bones provide support for our bodies and help form our shape. The skull protects the brain and forms the shape of our face. The spinal cord, a pathway for messages between the brain and the body, is protected by the backbone, or spinal column. The ribs form a cage that shelters the heart, lungs, liver, and spleen, and the pelvis helps protect the bladder, intestines, and in girls, the reproductive organs. Joints are where two bones meet. They make the skeleton flexible â€" without them, movement would be impossible. Muscles are also necessary for movement: Together, our bones, muscles, and joints â€" along with tendons, ligaments, and cartilage â€" form our musculoskeletal system and enable us to do everyday physical activities. The human skeleton has bones. Our bones begin to develop before birth. When the skeleton first forms, it is made of flexible cartilage, but within a few weeks it begins the process of ossification pronounced: Ossification is when the cartilage is replaced by hard deposits of calcium phosphate and stretchy collagen, the two main components of bone. It takes about 20 years for this process to be completed. The bones of kids and young teens are smaller than those of adults and contain "growing zones" called growth plates. These plates consist of columns of multiplying cartilage cells that grow in length, and then change into hard, mineralized bone. These growth plates are easy to spot on an X-ray. Because girls mature at an earlier age than boys, their growth plates change into hard bone at an earlier age. Bone contains three types of cells: AHS-tee-uh-blastz , which make new bone and help repair damage; osteocytes pronounced: AHS-tee-o-klasts , which break down bone and help to sculpt and shape it. Osteoclasts are very active in kids and teens, working on bone as it is remodeled during growth. They also play an important role in the repair of fractures. Bones are made up of calcium, phosphorus, sodium, and other minerals, as well as the protein collagen. Calcium is needed to make bones hard, which allows them to support your weight. The amounts of certain vitamins and minerals that you eat, especially vitamin D and calcium, directly affect how much calcium is stored in the bones. The soft bone marrow inside many of our bones is where most of the blood cells flowing through our bodies are made. White blood cells help the body fight infection. Bones are made up of two types of material â€" compact bone and cancellous bone. Compact bone is the solid, hard outside part of the bone. This type of bone makes up most of the human skeleton. It looks like ivory and is extremely strong. KAN-suh-lus bone, which looks like a sponge, is inside the compact bone. It is made up of a mesh-like network of tiny pieces of bone called trabeculae pronounced: This is where red and white blood cells are formed in the marrow. Bones are fastened to other bones by long, fibrous straps called ligaments pronounced: KAR-tul-ij , a flexible, rubbery substance in our joints, supports bones and protects them where they rub against each other. Muscles pull on the joints, allowing us to move. They also help the body perform other functions so we can grow and remain strong, such as chewing food and then moving it through the digestive system. The human body has more than muscles. They are connected to bones by tough, cord-like tissues called tendons, which allow the muscles to pull on bones. If you wiggle your fingers, you can see the tendons on the back of your hand move as they do their work. Humans have three different kinds of muscle: Skeletal muscle is attached to bone, mostly in the legs, arms, abdomen, chest, neck, and face. Skeletal muscles are called striated pronounced: STRY-ay-ted because they are made up of fibers that have horizontal stripes when viewed under a microscope. These muscles hold the skeleton together, give the body shape, and help it with everyday movements they are known as voluntary muscles because you can control their movement. They can contract shorten or tighten quickly and powerfully, but they tire easily and have to rest between workouts. Smooth, or involuntary, muscle is also made of fibers, but this type of muscle looks smooth, not striated. Examples of smooth muscles are the walls of the stomach and intestines, which help break up food and move it through the digestive system. Smooth muscle is also found in the walls of blood vessels, where it squeezes the stream of blood flowing through the vessels to help maintain blood pressure. KAR-dee-ak muscle is found in the heart.

Cardiac muscle is also an involuntary type of muscle. Its rhythmic, powerful contractions force blood out of the heart as it beats. Muscles and Movement Even when you sit perfectly still, there are muscles throughout your body that are constantly moving. Muscles enable your heart to beat, your chest to rise and fall as you breathe, and your blood vessels to help regulate the pressure and flow of blood through your body. When we smile and talk, muscles are helping us communicate, and when we exercise, they help us stay physically fit and healthy. The movements your muscles make are coordinated and controlled by the brain and nervous system. The involuntary muscles are controlled by structures deep within the brain and the upper part of the spinal cord called the brain stem. The voluntary muscles are regulated by the parts of the brain known as the cerebral motor cortex and the cerebellum. When you decide to move, the motor cortex sends an electrical signal through the spinal cord and peripheral nerves to the muscles, causing them to contract. The motor cortex on the right side of the brain controls the muscles on the left side of the body and vice versa. This feedback results in smooth, coordinated motion. If you want to lift your arm, your brain sends a message to the muscles in your arm and you move it. When you run, the messages to the brain are more involved, because many muscles have to work in rhythm. Muscles move body parts by contracting and then relaxing. So they work in pairs of flexors and extensors. The flexor contracts to bend a limb at a joint. For example, the biceps muscle, in the front of the upper arm, is a flexor, and the triceps, at the back of the upper arm, is an extensor. When you bend at your elbow, the biceps contracts. Then the biceps relaxes and the triceps contracts to straighten the elbow. Joints allow our bodies to move in many ways. Some joints open and close like a hinge such as knees and elbows , whereas others allow for more complicated movement â€” a shoulder or hip joint, for example, allows for backward, forward, sideways, and rotating movement. Joints are classified by their range of movement. The dome of the skull, for example, is made of bony plates, which must be immovable to protect the brain. Between the edges of these plates are links, or joints, of fibrous tissue. Fibrous joints also hold the teeth in the jawbone. Partially movable, or cartilaginous pronounced: They are linked by cartilage, as in the spine. Each of the vertebrae in the spine moves in relation to the one above and below it, and together these movements give the spine its flexibility. Freely movable, or synovial pronounced: The main joints of the body â€” found at the hip, shoulders, elbows, knees, wrists, and ankles â€” are freely movable. They are filled with synovial fluid, which acts as a lubricant to help the joints move easily. There are three kinds of freely movable joints that play a big part in voluntary movement: Hinge joints allow movement in one direction, as seen in the knees and elbows. Pivot joints allow a rotating or twisting motion, like that of the head moving from side to side. Ball-and-socket joints allow the greatest freedom of movement. The hips and shoulders have this type of joint, in which the round end of a long bone fits into the hollow of another bone. Muscles can weaken, and joints as well as tendons, ligaments, and cartilage can be damaged by injury or disease. The following are problems that can affect the bones, muscles, and joints in teens: Arthritis is the inflammation of a joint, and people who have it experience swelling, warmth, pain, and often have trouble moving. Although we often think of arthritis as a condition that affects only older people, arthritis also can affect children and teens. Health problems that involve arthritis in kids and teens include juvenile idiopathic arthritis JIA, also know as juvenile rheumatoid arthritis, or JRA , lupus , Lyme disease , and septic arthritis a bacterial infection of a joint. A fracture is when a bone breaks; it may crack, snap, or shatter. After a bone fracture, new bone cells fill the gap and repair the break. Applying a strong plaster cast, which keeps the bone in the correct position until it heals, is the usual treatment. If the fracture is complicated, metal pins and plates can be placed to better stabilize the fracture while the bone heals. DIS-truh-fee is an inherited group of diseases that affect the muscles, causing them to weaken and break down over time. The most common form in childhood is called Duchenne muscular dystrophy, and it most often affects boys. OSD usually strikes active teens around the beginning of their growth spurts, the approximately 2-year period during which they grow most rapidly.

Chapter 4 : MUSCLES AND MOVEMENT

The muscles in the body provide the means of all movements. When stimulated by a nerve, the muscle contracts to become shorter and thicker and thus it pulls the bone at the movable end. Most actions in our body like standing, walking, running, playing etc. require combined action of several muscles.

As these muscles contract and relax, they move skeletal bones to create movement of the body. Smaller muscles help the larger muscles, stabilize joints, help rotate joints, and facilitate other fine-tuned movements. The largest muscle masses in the leg are present in the thigh and the calf. The muscles that make up the quadriceps are the strongest and leanest of all muscles in the body. These four muscles at the front of the thigh are the major extensors help to extend the leg straight of the knee. On the outside of the thigh, this is the largest of the quadriceps. It extends from the top of the femur to the kneecap, or patella. This teardrop-shaped muscle of the inner thigh attaches along the femur and down to the inner border of the kneecap. Between the vastus medialis and the vastus lateralis at the front of the femur, it is the deepest of the quadriceps muscles. This muscle attaches to the kneecap. Of the quadriceps muscles, it has the least affect on flexion of the knee. The hamstrings are three muscles at the back of the thigh that affect hip and knee movement. They begin under the gluteus maximus behind the hipbone and attach to the tibia at the knee. This long muscle flexes the knee. It begins in the thigh area and extends to the head of the fibula near the knee. This long muscle extends from the pelvis to the tibia. It extends the thigh, flexes the knee, and helps rotate the tibia. This muscle also extends the thigh and flexes the knee. The calf muscles are pivotal to movement of the ankle, foot, and toes. Some of the major muscles of the calf include: One of the large muscles of the leg, it connects to the heel. It flexes and extends the foot, ankle, and knee. This muscle extends from the back of the knee to the heel. It is important in walking and standing. This small, thin muscle is absent in about 10 percent of people. The gastrocnemius muscle supersedes its function. Possibly the most important tendon in terms of mobility is the Achilles tendon. This important tendon in the back of the calf and ankle connects the plantaris, gastrocnemius, and soleus muscles to the heel bone. It stores the elastic energy needed for running, jumping, and other physical activity.

Chapter 5 : List of movements of the human body - Wikipedia

Core KnowledgeÂ® National Conference, Muscles and Bones: Framework and Movement, 3rd Grade 3 2. Pages of The Incredible Human Body copied for each student 3. Appendix A: The Mighty Muscle (one per stud.

The lower leg extends from the knee to the ankle. This area is commonly referred to as the calf. Lower leg bones Tibia. Also called the shin bone, the tibia is the longer of the two bones in the lower leg. It acts as the main weight-bearing bone of the leg. The fibula is located next to the tibia. It mainly serves as an attachment point for the muscles of the lower leg. Lower leg muscles Gastrocnemius. This is one of the main muscles in the calves. It allows for a type of movement called plantar flexion in the ankle. This allows the toes to point downward. This large muscle is located behind the gastrocnemius. It also helps with plantar flexion. This is a small muscle in the back of the lower leg. These muscles are found on the front and back sides of the lower leg. The muscles in the front allow for dorsiflexion. This involves pointing the toes upward. The muscles in the back help with plantar flexion and supporting the arch of the foot. These muscles are located on the front side of the lower leg. They help with dorsiflexion. Other important structures Fibular nerves. Fibular nerves stimulate the muscles of the front part of the lower leg. These nerves are branches of the sciatic nerve. This is one of the main nerves in the leg. Tibial nerves stimulate muscles in the back of the lower leg. The Achilles tendon attaches the muscles of the calves to the bones of the ankle and foot. The ankle is a joint that connects the lower leg to the foot. Its main function is to allow for plantar flexion and dorsiflexion of the foot. Ankle bones The ankle is made off the tibia and fibula of the leg as well as the talus of the foot. Ankle ligaments The ankle contains two groups of ligaments: The feet are made up of many bones , muscles , and ligaments. In fact, nearly one-quarter of the bones in the body are found in the feet. Foot bones Tarsals The tarsal bones are found near the ankle, in the middle of the foot, where they form an arch. The seven tarsal bones are the:

Chapter 6 : Human musculoskeletal system - Wikipedia

The muscles of the body are all attached to the bones. As the contraction of the muscles occurs, the bones that are connected will react in a lever movement. This in return will lead to movement of various parts.

Biology for Kids Muscular System Muscles are how we move and live. All movement in the body is controlled by muscles. Some muscles work without us thinking, like our heart beating, while other muscles are controlled by our thoughts and allow us to do stuff and move around. There are over muscles in the human body. They are under our skin and cover our bones. Muscles often work together to help us move. For example, we just think of running and our body does the rest. How Muscles Work Muscles work by expanding and contracting. Muscles have long, thin cells that are grouped into bundles. When a muscle fiber gets a signal from its nerve, proteins and chemicals release energy to either contract the muscle or relax it. Many of our muscles come in pairs. An example of this is the biceps and triceps in our arms. When the biceps contract the triceps will relax, this allows our arm to bend. When we want to straighten our arm back out, the biceps will relax and the triceps will contract. Muscle pairs allow us to move back and forth. Types of Muscles Skeletal Muscles - These are the muscles we use to move around. They cover our skeleton and move our bones. Sometimes they are called striped muscles because they come in long dark and light bands of fibers and look striped. These muscles are voluntary because we control them directly with signals from our brains. These muscles work without us having to think about them. Cardiac Muscle - This is a special muscle that pumps our heart and blood through our body. Tendons Tendons connect muscles to bones. Tendons help form a connection between soft contracting muscle cells to hard bone cells. Muscle Memory When we practice an action over and over again, we get what is called muscle memory. It allows us to become more skilled at certain activities such as sports and music. As we practice, our muscles tune themselves to become more precise in their motions and to do exactly what our brain wants them to do. So remember, practice makes perfect! Muscles and Exercise When we exercise we work our muscles allowing them to become bigger and stronger. Exercise helps keep your muscles strong and flexible. Fun Facts about Muscles Shivering is caused by hundreds of muscles expanding and contracting to produce heat and make us warmer. It takes 17 muscles to smile and 43 muscles to frown. All the more reason to smile instead of frown! Our longest muscle is the Sartorius. It runs from the hip to the knee and helps us bend the knee and twist our leg. The strongest muscle is in our jaw and is used for chewing. The smallest muscle is in our ear and is called the stapedius. It is attached to the smallest bone in the body, the stapes. Activities Take a ten question quiz about this page.

Chapter 7 : Muscular and Skeletal Systems

Bones play a passive role in movement, but their shapes, lengths, and places where muscles can attach dictate how the body moves. Joints are where two bones meet. Movement occurs at the joints.

Interaction of the Two Systems Links The single-celled protozoan ancestors of animals had their weight supported by water and were able to move by cilia or other simple organelles. The evolution of large and more complex organisms animals necessitated the development of support and locomotion systems. Animals use their muscular and skeletal systems for support, locomotion, and maintaining their shape. This movement is a result of contraction of muscles. The skeleton helps transmit that movement. Skeletons are either a fluid-filled body cavity, exoskeletons , or internal skeletons. Hydrostatic skeletons consist of fluid-filled closed chambers. Internal pressures generated by muscle contractions cause movement as well as maintain the shape of the animals, such as the sea anemone and worms. The sea anemone has one set of longitudinal muscles in the outer layer of the body, and a layer of circular muscles in the inner layer of the body. The anemone can elongate or contract its body by contracting one or the other set of muscles. Structure and function of a hydrostatic skeleton. Images from Purves et al. Exoskeletons are characteristic of the Phylum Arthropoda. Exoskeletons are hard segments that cover the muscles and visceral organs. Muscles for movement attach to the inner surface of the exoskeleton. Exoskeletons restrict the growth of the animal, thus it must shed its exoskeleton or molt to form a new one that has room for growth. The bulk and weight of the exoskeleton and associated mechanical problems limits the size animals can attain. Spiders use a combination of an exoskeleton for protection and fluid pressure for movement. Exoskeleton of an insect and its relation to the muscular system. Image from Purves et al. Muscles are on the outside of the endoskeleton. Cartilage and bone are types of connective tissue. Sharks, and rays have skeletons composed entirely of cartilage; other vertebrates have an embryonic cartilage skeleton progressively replaced by bone as they mature and develop. Some areas of the human body, however, retain cartilage in the adult: Functions of Muscles and Bones Back to Top The skeleton and muscles function together as the musculoskeletal system. This system often treated as two separate systems, the muscular , and skeletal plays an important homeostatic role: Certain cells in the bones produce immune cells as well as important cellular components of the blood. Bone also helps regulate blood calcium levels, serving as a calcium sink. Rapid muscular contraction is important in generating internal heat, another homeostatic function. The Axial and Appendicular Skeletons Back to Top The axial skeleton consists of the skull, vertebral column, and rib cage. The human skull, or cranium , has a number of individual bones tightly fitted together at immovable joints. At birth many of these joints are not completely sutured together as bone, leading to a number of "soft spots" or fontanels , which do not completely join until the age of months. The vertebral column has 33 individual vertebrae separated from each other by a cartilage disk. These disks allow a certain flexibility to the spinal column, although the disks deteriorate with age, producing back pain. The sternum is connected to all the ribs except the lower pair. Cartilage allows for the flexibility of the rib cage during breathing. The arms and legs are part of the appendicular skeleton. The upper bones of the limbs are single: Below a joint elbow or knee , both limbs have a pair of bones radius and ulna in the arms; tibia and fibula in legs that connect to another joint wrist or ankle. The carpals makeup the wrist joint; the tarsals are in the ankle joint. Each hand or foot ends in 5 digits fingers or toes composed of metacarpals hands or metatarsals feet. Limbs are connected to the rest of the skeleton by collections of bones known as girdles. The pectoral girdle consists of the clavicle collar bone and scapula shoulder blade. The humerus is joined to the pectoral girdle at a joint and is held in place by muscles and ligaments. A dislocated shoulder occurs when the end of the humerus slips out of the socket of the scapula, stretching ligaments and muscles. The pelvic girdle consists of two hipbones that form a hollow cavity, the pelvis. The vertebral column attaches to the top of the pelvis; the femur of each leg attaches to the bottom. The pelvic girdle in land animals transfers the weight of the body to the legs and feet. Pelvic girdles in fish, which have their weight supported by water, are primitive; land animals have more developed pelvic girdles. Pelvic girdles in bipeds are recognizable different from those or quadrupeds. Bone Tissue Back to Top Although bones vary greatly in size and shape, they have

certain structural similarities. Bones have cells embedded in a mineralized calcium matrix and collagen fibers. Compact bone forms the shafts of long bones; it also occurs on the outer side of the bone. Spongy bone forms the inner layer. Structure of bone, a type of connective tissue. Compact bone has a series of Haversian canals around which concentric layers of bone cells osteocytes and minerals occur. New bone is formed by the osteocytes. The Haversian canals form a network of blood vessels and nerves that nourish and monitor the osteocytes. Spongy bone occurs at the ends of long bones and is less dense than compact bone. The spongy bone of the femur, humerus, and sternum contains red marrow, in which stem cells reproduce and form the cellular components of the blood and immune system. Yellow marrow, at the center of these bones, is used to store fats. The outer layer of the bones is known as the periosteum. The inner layer of the periosteum forms new bone or modifies existing bone to meet new conditions. It is rich in nerve endings and blood and lymphatic vessels. When fractures occur, the pain is carried to the brain by nerves running through the periosteum. Bone Growth Back to Top Endochondral ossification is the process of converting the cartilage in embryonic skeletons into bone. Cartilage is deposited early in development into shapes resembling the bones-to-be. Cells inside this cartilage grow and begin depositing minerals. The spongy bone forms, and osteoblasts attach and lay down the mineral portions of spongy bone. Osteoclasts remove material from the center of the bone, forming the central cavity of the long bones. The perichondrium , a connective tissue, forms around the cartilage and begins forming compact bone while the above changes are occurring. Blood vessels form and grow into the perichondrium, transporting stem cells into the interior. Two bands of cartilage remain as the bone develops, one at each end of the bone. During childhood, this cartilage allows for growth and changes in the shape of bones. Eventually the elongation of the bones stops and the cartilage is all converted into bone. Growth of a long bone. Bones continue to change as adults, to adapt to the stresses generated by physical activity. Exercise can increase the diameter and strength of bone; inactivity can decrease them. Age is a factor: Increasing calcium intake, reducing protein intake, exercise and low doses of estrogen are effective treatments for osteoporosis. Joints Back to Top There are three types of joints: Immovable joints, like those connecting the cranial bones, have edges that tightly interlock. Partly movable joints allow some degree of flexibility and usually have cartilage between the bones; example: Synovial joints permit the greatest degree of flexibility and have the ends of bones covered with a connective tissue filled with synovial fluid; example: The outer surface of the synovial joints contains ligaments that strengthen joints and hold bones in position. The inner surface the synovial membrane has cells producing synovial fluid that lubricates the joint and prevents the two cartilage caps on the bones from rubbing together. Some joints also have tendons connective tissue linking muscles to bones. Bursae are small sacs filled with synovial fluid that reduce friction in the joint. The knee joint contains 13 bursae Joints of the human body. Skeletal Disorders Injury, degenerative wear and tear, and inflammatory disorders affect joints. Sprains are common injuries that cause ligaments to rip of separate from the bone. Tendinitis such as tennis elbow and bursitis are inflammations of the tendon sheaths. Osteoarthritis is a degenerative condition associated with the wearing away of the protective caps of cartilage covering the bone-ends. Bony growths or spurs develop as the cartilage degenerates, causing restriction of movement and pain. The cause is not known and may just be wear-and-tear associated with aging. Rheumatoid arthritis is a severely damaging arthritis that begins with inflammation and thickening of the synovial membrane followed by bone degeneration and disfigurement. More women than men are affected. There may be a genetic predisposition to rheumatoid arthritis. Joint replacement may in some cases restore function.

Chapter 8 : The Body's Bones and Muscles - Healthy Living Center - Everyday Health

Synovial joints allow the body a tremendous range of movements. Each movement at a synovial joint results from the contraction or relaxation of the muscles that are attached to the bones on either side of the articulation.

Cartilage and Ligaments The coordinated efforts of all these parts provide the necessary outcome from the system. The Musculoskeletal System Of The Human Body Is A Collection Of Components That Help In Supporting, Stabilizing And Moving The Body Parts Whether you are sprinting your way up the school hall, you are scoring big time in a sports event, you are shooting ducks with friends or you are performing in any other physical activity of our daily life, the usage of your bones, muscles, and joints is taking place simultaneously. No movement of the human body can be possible without the efforts of these vital components. In their absence, you will even lose the ability for sitting, standing, walking and to some extent even comfortably sleeping. This same structure or framework is responsible for giving the body its shape and necessary protection to the softer more vulnerable organs and body parts. Even with their light weights and lean structures, bones are one of the strongest parts of the human body and are responsible for supporting the whole body weight. The legs, in particular, are also incredibly important for supporting your body weight. Check out our article on how to get thicker thighs. Joints are the connecting points for two different bones. They provide the necessary flexibility to the skeletons. Moving the human body cannot be possible without this vital part. Muscles The movement of the body is not just dependent on the presence of joints but also on muscles that are attached to the bones. In more scientific terms, muscles are made from the tough mass that has some amount of elasticity. This characteristic allows the bones to be pulled during any sort of movement. With the combined efforts of these three basic components, the body is able to perform various activities. There are also supporting components in the process like tendons, ligaments e. To help with this, check out our buying guide for the best ab machines. How do muscles move bones? Not working in isolation, the muscles create a pull on the bony structures that provide them the ability to move in a particular direction. The muscles of the body are all attached to the bones. As the contraction of the muscles occurs, the bones that are connected will react in a lever movement. This in return will lead to movement of various parts. The muscles of our body are made from fiber based tissues. These are attached to the bones with the help of tissues called tendons. So it is actually the tendon that creates and reacts to the movement orders. The much-needed flexibility is provided by joints that are of several types. When the need for any necessary activity is felt by the brain, it will generate the movement order. In technical terms, the motor cortex of the brain will create electrical signals send to the muscle through the spine and localized nerves. As soon as the command from the brain is received the muscles contract and movement is initiated. During movement, the signaling is done with the cerebellum portion of the brain. This to and fro movement of the signals creates the necessary movement with the required strength. Flexors and Extensors Muscles always work in groups or pairs. The two muscles that are most popular when it comes to moving are called antagonistic muscles. As already described the movement of the body is possible with pulling of muscles to move a bone. Muscles used for bending bones are called flexors and those that straighten up things are called extensors. They work together to create the necessary bodily movements for our day to day activities. Check out our buying guide here: They are classified into the following categories: Rotation Movements The fourth form of movement also occurs that combines the rotational and angular moves. It should be kept in mind that this is only a simple version of the working of this system. In reality, the process is very complex and involves a large number of nerves, tissues, and components. So the next time you are sitting idle at the gym, just stop and think about all the movements that you make only in a single minute. Just imagine how many bones, muscles, tendons, ligaments and joints will be involved in moving your body for a simple single minute. It is the mechanism of antagonistic muscles, extensors and flexors that help the bones to move and carryout the necessary functions and activities. Without them, the life of a human being will come to a complete stand still. It would be living like a vegetable. For any further comments and feedback, you can surely contact us! Your friends might care about this information. Get Fit with WiryBody.

Chapter 9 : How Do Muscles Move Bones? The Basics Of Musculoskeletal System | Wiry Body!

The list below describes such skeletal movements as normally are possible in particular joints of the human body. Other animals have different degrees of movement at their respective joints; this is because of differences in positions of muscles and because structures peculiar to the bodies of humans and other species block motions unsuited to their anatomies.

There are three types of muscle tissue: Visceral, cardiac, and skeletal. Visceral Muscle Visceral muscle is found inside of organs like the stomach , intestines, and blood vessels. The weakest of all muscle tissues, visceral muscle makes organs contract to move substances through the organ. Because visceral muscle is controlled by the unconscious part of the brain, it is known as involuntary muscleâ€"it cannot be directly controlled by the conscious mind. This smooth appearance starkly contrasts with the banded appearance of cardiac and skeletal muscles. Cardiac Muscle Found only in the heart , cardiac muscle is responsible for pumping blood throughout the body. Cardiac muscle tissue cannot be controlled consciously, so it is an involuntary muscle. While hormones and signals from the brain adjust the rate of contraction, cardiac muscle stimulates itself to contract. The natural pacemaker of the heart is made of cardiac muscle tissue that stimulates other cardiac muscle cells to contract. Because of its self-stimulation, cardiac muscle is considered to be autorhythmic or intrinsically controlled. The cells of cardiac muscle tissue are striatedâ€"that is, they appear to have light and dark stripes when viewed under a light microscope. The arrangement of protein fibers inside of the cells causes these light and dark bands. Striations indicate that a muscle cell is very strong, unlike visceral muscles. The cells of cardiac muscle are branched X or Y shaped cells tightly connected together by special junctions called intercalated disks. Intercalated disks are made up of fingerlike projections from two neighboring cells that interlock and provide a strong bond between the cells. The branched structure and intercalated disks allow the muscle cells to resist high blood pressures and the strain of pumping blood throughout a lifetime. These features also help to spread electrochemical signals quickly from cell to cell so that the heart can beat as a unit. Skeletal Muscle Skeletal muscle is the only voluntary muscle tissue in the human bodyâ€"it is controlled consciously. Every physical action that a person consciously performs e. The function of skeletal muscle is to contract to move parts of the body closer to the bone that the muscle is attached to. Most skeletal muscles are attached to two bones across a joint, so the muscle serves to move parts of those bones closer to each other. Skeletal muscle cells form when many smaller progenitor cells lump themselves together to form long, straight, multinucleated fibers. Striated just like cardiac muscle, these skeletal muscle fibers are very strong. Skeletal muscle derives its name from the fact that these muscles always connect to the skeleton in at least one place. Gross Anatomy of a Skeletal Muscle Most skeletal muscles are attached to two bones through tendons. Tendons are tough bands of dense regular connective tissue whose strong collagen fibers firmly attach muscles to bones. Tendons are under extreme stress when muscles pull on them, so they are very strong and are woven into the coverings of both muscles and bones. Muscles move by shortening their length, pulling on tendons, and moving bones closer to each other. One of the bones is pulled towards the other bone, which remains stationary. The place on the stationary bone that is connected via tendons to the muscle is called the origin. The place on the moving bone that is connected to the muscle via tendons is called the insertion. The belly of the muscle is the fleshy part of the muscle in between the tendons that does the actual contraction. Names of Skeletal Muscles Skeletal muscles are named based on many different factors, including their location, origin and insertion, number of origins, shape, size, direction, and function. Many muscles derive their names from their anatomical region. The rectus abdominis and transverse abdominis, for example, are found in the abdominal region. Some muscles, like the tibialis anterior , are named after the part of the bone the anterior portion of the tibia that they are attached to. Other muscles use a hybrid of these two, like the brachioradialis, which is named after a region brachial and a bone radius. Some muscles are named based upon their connection to a stationary bone origin and a moving bone insertion. These muscles become very easy to identify once you know the names of the bones that they are attached to. Examples of this type of muscle include the sternocleidomastoid connecting the sternum and clavicle to the

mastoid process of the skull and the occipitofrontalis connecting the occipital bone to the frontal bone. Some muscles connect to more than one bone or to more than one place on a bone, and therefore have more than one origin. A muscle with two origins is called a biceps. A muscle with three origins is a triceps muscle. Finally, a muscle with four origins is a quadriceps muscle. Shape, Size, and Direction. We also classify muscles by their shapes. For example, the deltoids have a delta or triangular shape. The serratus muscles feature a serrated or saw-like shape. The rhomboid major is a rhombus or diamond shape. The size of the muscle can be used to distinguish between two muscles found in the same region. The gluteal region contains three muscles differentiated by sizeâ€"the gluteus maximus large , gluteus medius medium , and gluteus minimus smallest. Finally, the direction in which the muscle fibers run can be used to identify a muscle. In the abdominal region, there are several sets of wide, flat muscles. The muscles whose fibers run straight up and down are the rectus abdominis , the ones running transversely left to right are the transverse abdominis, and the ones running at an angle are the obliques. Muscles are sometimes classified by the type of function that they perform. Most of the muscles of the forearms are named based on their function because they are located in the same region and have similar shapes and sizes. For example, the flexor group of the forearm flexes the wrist and the fingers. The supinator is a muscle that supinates the wrist by rolling it over to face palm up. In the leg, there are muscles called adductors whose role is to adduct pull together the legs. Groups Action in Skeletal Muscle Skeletal muscles rarely work by themselves to achieve movements in the body. More often they work in groups to produce precise movements. The muscle that produces any particular movement of the body is known as an agonist or prime mover. The agonist always pairs with an antagonist muscle that produces the opposite effect on the same bones. For example, the biceps brachii muscle flexes the arm at the elbow. As the antagonist for this motion, the triceps brachii muscle extends the arm at the elbow. When the triceps is extending the arm, the biceps would be considered the antagonist. Synergists are muscles that help to stabilize a movement and reduce extraneous movements. They are usually found in regions near the agonist and often connect to the same bones. Because skeletal muscles move the insertion closer to the immobile origin, fixator muscles assist in movement by holding the origin stable. If you lift something heavy with your arms, fixators in the trunk region hold your body upright and immobile so that you maintain your balance while lifting. Skeletal Muscle Histology Skeletal muscle fibers differ dramatically from other tissues of the body due to their highly specialized functions. Many of the organelles that make up muscle fibers are unique to this type of cell. The sarcolemma is the cell membrane of muscle fibers. The sarcolemma acts as a conductor for electrochemical signals that stimulate muscle cells. Connected to the sarcolemma are transverse tubules T-tubules that help carry these electrochemical signals into the middle of the muscle fiber. Myofibrils are made up of many proteins fibers arranged into repeating subunits called sarcomeres. The sarcomere is the functional unit of muscle fibers. See Macronutrients for more information about the roles of sugars and proteins. Sarcomere Structure Sarcomeres are made of two types of protein fibers: Thick filaments are made of many bonded units of the protein myosin. Myosin is the protein that causes muscles to contract. Thin filaments are made of three proteins: Actin forms a helical structure that makes up the bulk of the thin filament mass. Actin contains myosin-binding sites that allow myosin to connect to and move actin during muscle contraction. Tropomyosin is a long protein fiber that wraps around actin and covers the myosin binding sites on actin. Bound very tightly to tropomyosin, troponin moves tropomyosin away from myosin binding sites during muscle contraction. Muscles are the only tissue in the body that has the ability to contract and therefore move the other parts of the body. Muscles often contract to hold the body still or in a particular position rather than to cause movement. Another function related to movement is the movement of substances inside the body. The cardiac and visceral muscles are primarily responsible for transporting substances like blood or food from one part of the body to another. The final function of muscle tissue is the generation of body heat. As a result of the high metabolic rate of contracting muscle, our muscular system produces a great deal of waste heat. Many small muscle contractions within the body produce our natural body heat. When we exert ourselves more than normal, the extra muscle contractions lead to a rise in body temperature and eventually to sweating. Skeletal Muscles as Levers Skeletal muscles work together with bones and joints to form lever systems. The muscle acts as the effort force; the joint acts as the fulcrum; the bone that the muscle moves acts

as the lever; and the object being moved acts as the load. There are three classes of levers, but the vast majority of the levers in the body are third class levers. A third class lever is a system in which the fulcrum is at the end of the lever and the effort is between the fulcrum and the load at the other end of the lever.