Physiology presentation on bone growth, muscular movement, and nerve transmission...

Psychology

Slide 1 Physiology Presentation On Bone Growth Muscular Movement Nerve Transmission Slide 2 Physiology of Bone Growth Understanding Bone Growth ? Ossification is a process of cartilage gradually changing into bone tissue. ??? Fetus's bones are made of cartilage. ??? During childhood, the cartilage is replaced by bony tissue. ??? New bone is formed along the epiphysical growth plates. ??? The epiphysical growth plates are found at the end of long bones as the body grows taller. ? Osteocytes are bone cells. There are two types of osteoclasts and osteoblasts. Osteoclasts break down areas of old or damaged bone. ??? 10% of entire skeleton is broken down and rebuilt each year (Turley, 2007). ??? Generally occurring in areas that are damaged or subjected to mechanical stress. ??? Osteoblasts are deposits of new tissue in those areas; forming, and rebuilding bones. ??? Begins as immature cells, but later becomes a mature cell that produces bone, cartilage, or collagen fibers. ? Through all stages of life, formation of new bone is dependent on having enough calcium and phosphorous in the diet. Calcium in the body is stored in the bone throughout the body. ??? Calcium is an extremely important mineral for proper functioning of skeletal muscles and heart, keeping them contracting regularly and forcefully. ??? After the osteoclasts process, calcium is continuously released to the rest of the body. Slide 2 Speaker Notes 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. Mature bone is a hard substance that is also a living tissue that undergoes change. Slide 3 IMAGE http://www. growtaller. net/ http://www. healthyfellow. com/images/2009/bone-growth. jpg Slide 4 Physiology of Muscular Movement ? Fascicle is a bundle of individual muscle fibers. These muscle fibers run parallel to each other, so when they contract they pull in the same direction (Turley, 2007). ??? Each muscle is composed of several muscle fascicles. Fascicles are composed of many muscle fibers surrounded by fascia. ??? The muscle is wrapped in fascia and connects to the tendon. ??? Fascia is a thin tissue sheet that connects each muscle or group of muscles. ??? The fascia merges into and becomes part of the tendon. ? Multinucleated is a muscle fiber having hundreds of nuclei scattered along the length of the muscle (Turley, 2007). ??? The nuclei help speed up the chemical process that must occur along the length of the muscle fiber before it can contract and move (Turley, 2007). ??? Each muscle fiber is composed of myofibrils. Myofibril is composed of thin strands of protein actin and thick strands of protein myosin. ??? Myofibril gives the skeletal muscle its characteristic striated (striped) appearance (Turley,

2007). ??? Actin and myosin is the source of a muscle contraction at a microscopic level (Turley, 2007). Speaker notes A muscle is composed of many parts. The body of the muscle is composed of muscle fascicles. Around each of the fascicles are arteries, veins, and nerves. Each fascicle contains bundles of muscle fibers (muscle cells) that contain thin strands of actin and thick strands of myosin.

Slide 5 ? Continue…. from slide 4 ? Neuromuscular junction is where each muscle fiber is connected to a single nerve cell. ??? Muscles contract in response to an electrical impulse from a nerve (Turley, 2007). ??? The nerve cell releases neurotransmitter acetylcholine (Turley, 2007). ??? Acetylcholine is a chemical messenger that is moved across to the neuromuscular junction. ??? Acts as a key to unlock receptors on the muscle fiber. ??? Changing the absorption of the membrane allows calcium ions to flow into the muscle fiber. Contractions are produced by calcium ions; calcium ions cause the thin actin to slide between the thick myosin, shortening the muscle and producing a muscle contraction (Turley, 2007). ??? The muscle eventually relaxes when ??? Acetylcholine is inactivated by an enzyme at the neuromuscular junction. ??? Calcium ions are pumped out of the cell. Speaker notes Even when not actively moving, your muscles are in partial contraction. This is from the nerve impulses from the brain and spinal cord. The nerve impulses produces muscle tone that keeps the muscles firm and ready to act.

This is the only aspect of the skeletal muscle activity that is not under conscious control. Slide 6 IMAGE http://www. bio. miami.

edu/~cmallery/150/neuro/sf43x15a. jpg http://faculty. etsu. edu/forsman/Histology%20of%20musclefor%20web_files/image013. jpg Slide 7 Physiology of Nerve Transmission ? Each neuron consists of three parts; the dendrites, a cell body, and an axon (Turley, 2007). ??? The dendrites are multiple branches at the beginning of a neuron that receive a neurotransmitter from previous neuron. ??? Converting it to an electrical impulse, and sending to the cell body. Nucleus is the cell body that directs cellular activities, providing energy for the cell. ??? Cytoplasm around the nucleus contains structures that produce neurotransmitters. ??? Neurotransmitters then are transported to the end of the axon (Turley, 2007). ? Axon is a single elongated branch at the end of the neuron. ??? The axon is covered by a fatty, white insulating layer of myelin (Turley, 2007). ??? The axon does not directly connect to the dendrites of the next neuron (Turley, 2007). ? Myelin keeps the electrical impulses on tract throughout its travel. ??? Myelin is only present on the axon of the neuron (Turley, 2007). Synapse are spaces between the axon of one neuron and the dendrites of the neuron ??? Electrical impulses cannot across the synapse. ??? Instead the axon releases a chemical messenger or neurotransmitter (Turley, 2007). ? Neurotransmitters cross the synapse and binds to receptors on the dendrites of the next neuron. ??? These processes all happen within a fraction of a second (Turley, 2007). Slide 7 speaker notes A neuron consists of several dendrites, cell body, and an axon. The dendrites receive nerve impulses from other neurons. The cell body contains the nucleus of the neuron.

The axon transmits nerve impulses to other neurons, whether it’s a muscle fiber, to a cell in an organ, or to a cell in a gland. Slide 8 http://www. clarian. org/ADAM/doc/graphics/images/en/9682. jpg http://www. cidpusa. org/synapse6. jpg Bones provide the structure for muscles to attach so that our bodies are able to move. Tendons are tough inelastic bands that hold attach muscle to bone. The nervous system ‘ communicates’ with muscle via neuromuscular (also called myoneural) junctions. These junctions (Figure 1) work very much like a synapse between neurons.

In other words: ??? the impulse arrives at the end bulb, ??? chemical transmitter is released from vesicles (each of which contains 5, 000 – 10, 000 molecules of acetylcholine) and diffuses across the neuromuscular cleft, ??? the transmitter molecules fill receptor sites in the membrane of the muscle & increase membrane permeability to sodium, ??? sodium then diffuses in & the membrane potential becomes less negative, ??? and, if the threshold potential is reached, an action potential occurs, an impulse travels along the muscle cell membrane, and the muscle contracts.

Some muscles (skeletal muscles) will not contract unless stimulated by neurons; other muscles (smooth & cardiac) will contract without nervous stimulation but their contraction can be influenced by the nervous system. Thus, the nervous and muscle systems are closely interconnected. Let’s now focus on muscle – what is its structure & how does it work.

Muscular movement is necessary, given as we are humans, and without muscular movement we would not have any strength of any kind. Without muscles, our bones would not be able to move and without bone growth, we

would not have any type of size or shape–we would be formless and shapeless individuals. Without nerve transmission, our bones and our muscles would not know what to do and when to do it. In conclusion, all these processes are interrelated.