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A bodybuilding and powerlifting guide :.

Muscle-bone connection in bodybuilding

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Building a stronger, more muscular body requires synergy between many systems. Strength athletes appreciate the need to promote a strong mind-muscle connection, since a mature neuromuscular system allows enhanced motor control for intense contractions. The muscle-bone connection is less understood but equally important. Without a strong musculoskeletal system, pulling or pushing 10 pounds would be impossible – not to mention a couple hundred!

Professional arm wrestlers provide a magnificent glance into musculoskeletal demands of intense physical activities. These athletes are highly dependent on strong bones, tendons, ligaments and cartilage – to withstand the build up of internal pressure during a competition. With the roar of a cheering crowd and the lure of cash rewards, many arm wresters' generate enough pressure to snap bones. Open fractures are not uncommon. Technique and arm strength play major rolls in winning, but frail bones can abruptly terminate a gridlock. In bodybuilding, flimsy bones can lead to premature failure during heavy exercises – perhaps severe injury.

Skeletal systems support passive and active movements in all mammals. The simple act of walking imposes strain on the body's internal structure. Muscle contractions, pulling or pushing against a resistance, place extreme mounts of tension on bone and connective tissue. A muscle works against a load using a lever-and-fulcrum system. Supported by bones, muscle tissues are activated using the body's joints as pivots. According to biomechanical analyses, muscle contractions during resistance training generate the greatest forces against the skeletal system.

Teams of pediatricians have demonstrated that muscle and bone strength are in close relationship in adolescents. In other words, children's bones readily adapt to increases in muscle. This muscle-bone link becomes less apparent after puberty. Even so, resistance exercise in adults has a great impact on building stronger bones in weakened conditions. Astronauts have adopted the need for resistance training during long space missions – to preserve muscle and bone tissue. Musculoskeletal losses experienced during bed rest recover quickly with resistance exercise in otherwise healthy adults. Concurrent endurance training does not help.

The adult skeleton is able to gain bone mass when needed. The long bone shafts in athletes are often much denser than their sedentary counterparts – differences of up

to 10 to 20 percent have been reported. It seems logical to assume bone strength is a requirement in building a more muscular body.

Getting adequate amounts of dietary calcium, and vitamin D for good absorption, is important for bodybuilders. Heavily trained athletes easily become deficient in calcium. Intense training increases blood acidity; this leads to the release of calcium salts from bone, to provide a base. Metabolic acidosis can also rob muscles of glutamine stores, another base nutrient for the blood. Athletes must consciously consume plenty of water and alkaline foods (most fruits and vegetables) to spare muscle and bone during phases of intense training. Supplemental glutamine can also have a blood-buffering effect, in large enough doses.

Aside from exercise and calcium, other daily measures can be taken to reinforce bone density. Mayo Clinic, an internationally renowned medical facility, suggests the avoidance of cigarettes and excessive intake of alcohol and caffeinated beverages. Chronic depression can increase rates of bone loss. Physicians at Mayo Clinic also warn against taking too much thyroid hormone, corticosteroids, selective serotonin reuptake inhibitors, anti-seizure medications, diuretics, aluminum-containing antacids and the blood-thinning medication heparin.

“Estrogens have been one of the most promising drugs for the therapeutic prevention of bone loss in these diseases,” said Thomas Spelsberg, Ph.D. His Mayo Clinic laboratory specializes in steroid hormones and growth factors in human bone and breast cancer tissues. “We are examining the important regulatory steps of estrogen action at the gene or genomic level in hopes of identifying the origins of bone loss and targets for prevention of bone loss.”

Mayo Clinic supports the use of tamoxifen, a selective estrogen receptor modulator, in the treatment of osteoporosis. Although the drug blocks estrogen in various tissues, it has an estrogen-like effect in others – bone cells are one example. Tamoxifen has shown to reduce the risk of bone fractures, especially in elderly women.

The use of anabolic-androgenic steroids and growth hormone are known to increase bone density via their anabolic properties. Clinical prescriptions for AAS and GH are discouraged today due to significant side effects, such as hirsutism, acne and altered libido. Nonetheless, nonmedical use of AAS and GH by competitive and recreational bodybuilders is widespread today.

Weak bones can limit the body’s force-producing potential; some symptoms include: bone fractures, loss of height over time, poor posture and back pain. Tough bones are mandatory for powerful muscles.

J Rittweger. Ten years muscle-bone hypothesis: What have we learned so far? -Almost a Festschrift-. J Musculoskelet Neuronal Interact. 2008 Apr-Jun;8(2):174-8. Institute for Biomedical Research into Human Movement, Manchester Metropolitan University, Cheshire, United Kingdom.

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