# Our Body's Kinetic Chain and Free Movement

GUEST CORNER
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### "DEM BONES" IN OUR BODY

You probably have heard the spiritual song "Dem Bones" of the 1920s by James Weldon Johnson with the following lyrics: "Toe bones are connected to the foot bone, foot bone connected to the heel bone, heel bone connected to the ankle bone, ankle bone connected to the leg bone" .... all the way to the "shoulder bone connected to the neck bone; neck bone connected to the head bone "how "dem bones gonna walk around". This song sums up in a nutshell the body's kinetic chain how it is linked together to work together.

### HISTORY OF THE KINETIC CHAIN IN OUR BODIES

The German engineer Franz Reuleuax is credited for defining the kinetic chain in machines in 1875: if both ends of a chain are fixed and an external force is applied, it receives and produces a force to the adjacent segment causing a movement pattern that generates a chain reaction. Years later, Orthopedic Surgeon Arthur Steindler applied the kinetic chain concept to the human body for rehabilitation when he stated, "the human body is linked together where energy is transferred from one fixed joint to the next joint to set the chain reaction in motion or make the body move." *

### UNDERSTANDING OUR HUMAN CHAIN REACTION

The musculoskeletal system is the movement mechanism of our bodies. It is a network of joints, muscles, ligaments, tendons, cartilage, connective tissue from our toes to the top of our head. The term "kinetic" means relates to or results from motion. Thus, for the body to move, or to set the kinetic chain reaction in motion, energy must be created and transferred in a coordinated and well-timed manner to move naturally and prevent injuries.

**The body can be divided in the upper and lower chain.**

- The upper kinetic chain includes our shoulders, shoulder blades, spinal column, arms, wrists, and hands.
- The lower kinetic chain consists of our feet, ankles, legs, hips, pelvis, and lower spine.

**Within the musculoskeletal system our body can perform close or open chain movements.**

- Open chain movements refer to the end part of the body moving freely in space; for example, waving your hand of sitting and kicking your lower leg straight up.
- Close chain movements refer to the distal/end part of the body being fixed against a solid object; for example, placing your foot on a stair to step up or put your hands on the wall.

During our daily lives, our body's kinetic chain performs open and close chain movements without interruption or conscious effort, unless you have an injury.

When you take a step forward, your toes, feet and ankles are flexed back to plant your feet on the ground for a close chain reaction. Or lower legs, thighs, butts, pelvic, core and postural muscles keep our body upright and stable. The spine and upper body automatically rotate slightly with the arms swinging freely for a balanced, open chain motion to produce a normal walking cadence.

### INTERRUPTION OF OUR BODY'S NORMAL KINETIC CHAIN REACTION

When you have an injury or are in pain, the connecting body parts compensate. For example, when you stub your toe and start limping, it may affect your knee, hip and back and can cause pain and unevenness of the pelvis that in turn results in pain, not only in your toe but in the rest of the lower kinetic chain. A similar problem can happen in the upper extremity when you slam your finger in the door and your neck goes into muscle spasm.

### STRENGTHENING EXERCISES TO STAY BALANCED AND MOVE FREELY

When doing exercises try to use as many combined muscles as possible in close and open chain movements. Remember to breathe when the muscles contract and never hold your breath. Here are three suggestions:

- Sit to stand: hold a 5lb weight in your hands. When upright, rotate your torso to the right and lift your left leg up to balance on your right leg. Sit down and repeat to the other side.
- Lunges: forward and sideways; hold a 5lb weight in your hands and rotate your torso performing a core crunch.
- Wall squats: with your back against the wall hold a 5lb weight in your hands. Squat down to a safe level, punch your arms forward and try to straighten up on one leg only.

### DAILY MOVEMENT FOR OUR HUMAN KINETIC CHAIN

Doing physical activity for 30 minutes every day keeps your kinetic chain strong and healthy. Whether you do fast-paced walking, gym workout, dancing, playing racquet ball, golf, do yoga or garden work...the key is not to sit all day.

**Include movement in your day-to-day routine.**

- Park your car far from the door to take extra steps.
- When talking on the phone, walk around or march in place.
- Climb the steps instead of taking the elevator.
- When cooking in the kitchen, dance around.
- Play outside with your kids, dogs, or grandkids.

If you have any difficulty performing any exercises or feel your body's kinetic chain is not moving freely or experience any pain, please contact your physician of physical therapist.

**A. Steindler, Kinesiology of the Human Body – Under Normal and Pathological Conditions (Charles C. Thomas, 1955)*

*Lize Lubbe is the owner of Lize Lubbe Physical Therapy with its main practice located at 892 Route 35 in Cross River and a PT Studio in the premises of Apex Fitness (where her team focus on the rehabilitation of sports-related injuries). Learn more by calling 914-875-9430, emailing contact@lizelubbept.com or visiting www.lizelubbept.com.*