The Rhythm of the Knee Joint

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I have always been an inquisitive person that likes to ask questions. As a boy it was endearing, as an adult it has caused many physicians to scratch their head. Allow me to explain. My father recently had a knee replacement. My question to the doctor was why that particular knee wore-out before the other one. Both knees are 74 years old and if we just change the part, isn't the mechanism or the imbalance still there? He scratched his head and said "yes." There are times we need to change the part, but if we want to truly correct the problem then we need to understand the "why." This can be a "Pandora's Box," but if our goal is to help our clients and family members, then it is a road that needs to be taken.

My clients have learned that when I imitate them walking and place band-aids on my knee to represent the knee ligaments, I am not making fun of them but trying to understand the stresses that caused the injury. If we can understand the position of discomfort, and see the interrelationships of all the parts of the knee joint, then we can come up with a unique strategy to strengthen the knee in function.

To begin a successful knee rehabilitation or strengthening program, we must first understand that the knee is a **dependant, reactive joint**. It reacts to the forces transferred from the foot and hip. The knee joint is made up of two bones – the femur and the tibia. It is not a hinge joint, but a tri-plane joint that must be able to move in all three planes of motion. If not, compensations and abnormal wear will occur. The proximal end of the femur attaches to the acetabulum to make up the hip joint. Any muscle that attaches to the femur will directly affect both the knee and the hip. The tibia sits on top of the talus at the ankle joint. Any muscles that attach to the tibia directly affect the foot and the knee. By understanding these relationships, we can apply an appropriate amount of stress to the knee to create dynamic stability. When too much load is applied to the knee, it will compensate and change the sequencing or the timing. Simply put, all the stuff has to be in the right place, at the right time, with the right amount of load.

Finding the cause of knee dysfunction is similar to a scavenger hunt. Asking your client "What can you do," "What can't you do," and most important, "What do you need

to be able to do" will give you some important clues. For example, a client of mine came in recovering from a right knee meniscus surgery. Her physical therapist was concerned that she lacked terminal knee extension in gait. While watching her walk, I noticed her body looked uncomfortable during swing phase of the right leg compared to when she planted. She told me that it felt like her right knee was unstable and wasn't lining up properly when she planted it. I placed her in right stride stance, what we call "RXX" or right foot forward, shoulder-width in the frontal plane, and toes pointing relatively forward in the transverse plane. She self-selected the distance. This didn't cause pain, but she lacked balance. A lack of balance is a lack of strength in a position and/or with motion. Our body will naturally compensate in order to find stability.

Many times a weakness of one leg can force the other leg to over work, disrupting the timing. When devising a strategy, we want to start with small successes and then slowly increase the challenge based on the client's needs. In this case, I had my client step onto a 4-inch step with her right leg to increase the load to the back left leg to help with stability. To limit the motion in the right knee, I had her perform a right knee "driver" by having her execute an anterior (forward) reach, anterior–medial (forward and to the left) reach, and an anterior–lateral (forward and to the right) reach. We progressed by incorporating the larger muscle groups of the hips, using a pelvic "driver." By driving the pelvis in all three planes – anterior and posterior, right lateral and left lateral, and right rotational and left rotational – we challenged the position with an appropriate amount of load. After performing these progressions, my client's right knee felt more stable and her gait was more efficient. She soon found that this was just the starting point. Because life is full of variables and obstacles, we continually challenged her by modifying her squats into lunges, increasing the distance of the step, speed, and direction. By asking questions, and most importantly, listening to our client's needs and wants, we can come up with creative strategies to assist the knees in function.