

A Knee to The Top - Part I

Recently receiving a large amount of communication concerning rehabilitating and strengthening the knee joint has prompted me to address the issue. Being a primary joint used during the power phase of bowling, I find it necessary to spend two months reviewing and discussing the topic. I would like to take this opportunity to thank all our **BTM** readers encouraging you to contact us if you have questions or concerns dealing with the relationships between fitness and bowling.

I have hypothesized for years there are strong correlations between the functional mobility of the knee joint and bowling performance. That is a powerful statement that at this time is not statistically supported, but rather theoretically based. The knee joint supports nearly 3/4 of the body's weight at all times while providing the muscular ability to balance yourself throughout the bowling approach. Bones, muscles, hinge movements, nerve impulses, and blood flow all work in a collaborative effort to enable your knees to function optimally. **Therefore, it is my belief in order to improve your bowling performance, it is pertinent you develop an anatomical and biomechanical understanding of the design and functions of the knee joint.**

By nature of sport, the knee generally sustains large amounts of stress, therefore classifying it as one of the most traumatized joints of the body. The knee is a very complex conglomeration of bony and tissue arrangements located at the distal end of the femur and the proximal end of the tibia and fibula bones. Though weak from a bony standpoint, your knee's greatest asset is a firm support system of muscles, ligaments, cartilage, and meniscus. Many athletes, both competitive and recreational, experience career threatening or ending knee injuries. In fact, recent studies have indicated nearly 50% of all athletic injuries occur to the knee joint or surrounding tissues. The above information along with the alarming incidence of injury has prompted us to:

1. Take an advantageous look at the inner workings and anatomy of the knee.
2. Analyze four bowling related knee injuries providing and defining rehabilitative methods.
3. Devise an effective training program for strengthening the knee joint and surrounding tissues as a preventive measure.

Anatomy

As one of the most complex and important joints in the body, the knee must receive a large amount of attention before we can apply any rehabilitative or training information. The knee is the largest joint in the body and because of poor bony alignments and a lack of muscle & fat padding is often prone to injury. Understanding the knee joint's anatomy and biomechanisms will enable us greater comprehension concerning the more common injuries and problems' bowlers incur.

The structural anatomy of the knee joint consists of the following bones, muscles, ligaments, and meniscus. They will briefly be defined and marked accordingly in **figures 1-5**. Use the corresponding **figures 1-5** to familiarize yourself with the design of your knees.

1. The **femur (a)** is the upper leg bone that extends from the hip joint to its attachment at the **tibia (b)** and **fibula (c)**. The femur is one of the largest and strongest bones in the body understandably withstanding a large portion of the body weight daily.
2. The **patella (d)**, a sesmoid bone, is free floating since it lies within the tendon of the **quadriceps muscle (e)**. Its function by design gives anterior protection to the knee joint and increases leverage to the knee on extension.
3. The well familiarized **anterior cruciate ligament** or **ACL (f)** is the direct connection between the distal end of the femur and the proximal end of the tibia. The ACL is best described as the most important of the four main knee ligaments. An injury to the ACL is usually career ending and extremely difficult to repair.
4. The **medial collateral (g)**, **lateral collateral (h)**, and **posterior cruciate ligaments (i)** are the other three main knee ligaments. They together act as stabilizers preventing hyperextension, hyperflexion, and excessive rotation at the knee joint.
5. The **menisci (j)** are two oval-shaped fibrocartilages designed to cushion the stress placed on the knee joint, improve congruity between the bones, and lubricate the joint by moving the synovial fluid.
6. The muscles of the upper anterior thighs that enable knee extension include the **vastus lateralis (k)**, **vastus medialis (L)**, **vastus intermedius (not shown)**, **rectus femoris (m)**. The upper posterior thigh muscles producing knee flexion are the **semimembranosus (n)**, **semitendinosus (o)**, and the **biceps femoris (p)**. The main muscle of the lower leg on the posterior side is the **gastrocnemius (q)**. It assists with knee flexion and ankle plantar flexion.

Athletic Injuries to the Knee Joint and Surrounding Tissues

In a previous injury report (February 1996 Vol. 3(2)) I defined the differences between acute and chronic injuries. Briefly reviewing, the acute injury usually results from a traumatic incident or experience such as a collision or sudden stop. On the other hand, the chronic or recurrent injury tends to develop over time resulting from repetitive motions. Both acute and chronic injuries to the knee can be detrimental to a bowler's performance and future. Since bowling is a non contact sport requiring the participant to perform a specifically learned sport skill, the most common injuries are of the chronic nature. Though acute injuries do occur in bowling, it is believed by this writer they are less frequent.

The following four injuries have been referred as some of the more common knee injuries occurring in the bowling community. Accompanying the specific injury are the **signs/symptoms (S/S)** that more closely define the problem and pinpoint with greater accuracy the injury experienced. The recommended **treatments (Rx)** are provided by the ***Athletic Injuries Manual, Revised Edition 1988***. Though not set in stone or always endorsed by the entire medical community, each recommended treatment has sound medical basis and should be given much consideration and inquiry. The **treatments (Rx)** vary from simple home remedies to minor therapeutic or arthroscopic measures. I strongly urge the bowling community who have either sustained a knee joint or related tissue injury or is recovering from one to adhere the treatment recommendations. **These simple measures, both preventive and ex post facto, performed in the confines of the home are means to manage an injury in a proactive and professional manner.**

1. **Ligament Sprain** - most frequently reported sport injury resulting from overstretched or minutely torn/irritated ligaments.
 - o **S/S:** possible pain in the knee joint, mainly joint stiffness or tightness, and point tenderness.
 - o **Rx:** immediate 24-hour rest, ice, compression, elevation, immobilization, cryokinetics, ultrasound, and knee joint strengthening.
2. **Patella tendonitis** - "Jumpers Knee" often occurs to out-of-shape athletes.
 - o **S/S:** pain on the lower portion of the patella, swelling, and pain upon palpation or touch.
 - o **Rx:** rest, ice, compression, elevation, immobilization, quadriceps stretching, and hamstring strengthening.
 - o *Patella tendonitis generally develops in stages:
 - Stage I - pain post practice
 - Stage II - pain during and post practice
 - Stage III - pain before, during, and after practice
 - Stage IV - significant loss of function.
3. **Bursitis** - results from a direct blow or continued kneeling on one or both knees, tendonitis may develop from overuse.
 - o **S/S:** localized posterior swelling, decreased range of motion during activity and daily living, joint tightness or stiffness, point tenderness, may also become painful and temporarily disabling.
 - o **Rx:** rest, ice, compression, elevation, immobilization, pad and protect during healing, and knee joint strengthening.
4. **Menisci Injury** - worsens with age
 - o **S/S:** knee clicking, catching, locking, giving way, swelling, and pain along the joint line.
 - o **Rx:** rest, ice, compression, elevation, immobilization, arthroscopic removal of a small portion of the patella or menisci to maintain stability, and knee joint strengthening.

Notice the initial part of each recommended treatment involves the **RICEI** system, otherwise known as **rest, ice, compression, elevation, and immobilization**. Each portion of the **RICEI** system can/should be completed two or three times daily. Follow the **RICEI** system guidelines and take a proactive response by initiating part of your rehabilitative/preventive measure within the home. Do not exceed the **RICEI** system guidelines; hence they may cause damaging effects when overemphasized.

- **Rest** - resting an injury will enable the body to function optimally throughout the healing process.
- **Ice** - provides an anesthetic effect, decreases muscle spasm, causes vasoconstriction of blood vessels, and increases cell metabolism. Ice should be applied to a damaged or swollen area as long as the skin is not torn or broken. The ice or cold pack should be wrapped in a towel or blanket and not applied directly to the skin. The icing procedure should be timed between 10-15 minutes maximum. **If skin irritation arises, discontinue the icing procedure and consult a medical provider.**
- **Compression** - decreases venous pooling or fluid accumulation in or around an injured area while increasing blood return. During rest, the icing procedure should be enacted and compressed **moderately** to the injured area.
- **Elevation** - decreases venous pooling or fluid accumulation in or around an injured area while increasing blood return. Elevation of an injured area during the icing procedure positively assists the reduction of swelling, cooling

optimal efficiency of the healing process.

- **Immobilization** - prevents additional stresses to injured areas allowing the **RICEI** system to apply its healing effects. Immobilization should occur during the icing procedure as well as the first 1-2 days after an initial injury.

Use the **RICEI** system guidelines to begin rehabilitating your knee injury or to prevent the prolonged development of a chronic problem. Follow these recommendations strictly preventing variance for safety reasoning. **Always consult your medical provider before initiating the RICEI system and/or if any complications arise from it.**

Knee injuries, especially in bowling, can be prevented by increasing the muscular strength of the surrounding tissues. **It is in your best interest, as dedicated bowlers, not only to learn and practice proper rehabilitative measures, but continually to strengthen the surrounding muscle tissues.** Next month, a detailed look at resistance, aerobic, and stretching exercise designed to improve knee strength, promote joint stability, and increase flexibility in those tight hamstring muscles. Together, add this month's and next month's material to your library keeping totally informed and actively involved at either preventing knee problems or promoting the healing process.