Innovative Research on Sports Rehabilitation and Physical Training

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INTRODUCTION

This book focuses on the combination of scientific research results obtained by the author through scientific research activities and practical operations in the past few years, including innovative methods and applications of sports rehabilitation. Significantly, the emergence of intelligent platforms, such as chatgpt and notification in the 5G Internet+ era, has dramatically changed how people participate in sports activities. Interdisciplinarity has become the norm in sports scientific research and application. This chapter also introduces innovative media and methods for physical training and sports rehabilitation.

With the changes in people's lifestyles during the pandemic, new changes have also occurred in sports functions and training methods. In the post-epidemic period, people generally have a deeper understanding of sports. Children, school-age students, fitness enthusiasts, professional athletes, and sports professionals all have new understandings and needs for sports activities. In this case, as a front-line worker in physical education and training, the author has received inquiries from many people about related issues. This article progresses from the shallower to the deeper, and the theoretical nature gradually strengthens. It contains a large number of practical experience summaries. It can meet the reading needs of different ages and groups and can explain common hot issues that arise in sports training one by one. As a sports scholar, he should be responsible for conveying more of what he has learned, felt, and received to readers on the premise of meeting his scientific research needs, popularizing knowledge, and benefiting the public.

Research methods: A large amount of writing inspiration has been accumulated from professional sports teams' practical work and scientific research in the early stages. By constantly participating in domestic and foreign academic conferences and seminars, searching for any relevant documents, and interviewing industry experts, the scientific research team finally summarized and formed the final research results.

Research results: The contents of this chapter have been increasingly used in modern sports training. The national team and sports enthusiasts can access relevant, innovative new media and methods. However, the use of science is uneven. It is foreseeable that such interdisciplinary scientific research methods and results will appear more and more. People will be more aware of the benefits and conveniences brought by innovative methods, and the market for sports social services will become broader.

CHAPTER 1

HUMAN BODY STRUCTURE

1.1. Muscle

Muscle (Latin: Musculus) is a kind of animal tissue that can contract. It belongs to soft tissue. It is divided into three types: skeletal muscle, cardiac muscle, and smooth muscle. Its primary function is to generate force and cause movement. Muscle cells have contractile fibers that change their size from cell to cell.

1.1.1 Muscle Strength

Muscles can be divided into absolute strength and relative strength.

The tension produced by a muscle when it is maximally contracted is the absolute muscle strength of that muscle. However, total muscle strength reflects the strength of all the muscle fibers that make up the muscle. It cannot remember the strength of each muscle fiber. To describe the strength of each muscle fiber, it is necessary to understand the concept of relative muscle strength. Relative muscle strength refers to the muscle strength of a muscle unit's cross-sectional area (generally a muscle cross-sectional area of 1 cm).

On the whole, the maximum weight a person can lift is the absolute strength of that person. Usually, the magnitude of total strength is directly proportional to a person's weight, and the greater the weight, the greater the absolute power.

If a person's absolute strength is divided by his weight, the person's relative strength can be obtained. Relative strength can better evaluate the strength quality of athletes.

It is worth mentioning that the speed of muscle contraction is related to the load size: if the load is small, the muscle contraction speed is fast; if the load is large, the muscle contraction speed is slow. When the load exceeds the ultimate load, the muscle tension reaches a maximum, but the contraction velocity is zero. If the load is gradually reduced, the rate of muscle contraction will gradually increase. When the load is zero, the muscle contraction velocity is at its maximum.

The relationship between strength and speed is that if other factors are the same, you must reduce the load if you want to get a faster contraction speed. If you want to overcome a more excellent load resistance, the speed of muscle contraction will slow down.

Therefore, small load training can increase the speed of muscle contraction. However, the muscles will undergo isometric contraction when carrying out maximum load training. Although the strength of the muscles can be well exercised, the contraction speed will remain the same. You must use the appropriate load and speed to achieve the maximum output power and get the best results.

Increased muscle strength can increase movement speed. Shorten Movement Time. Under the same load conditions, the greater the strength, the faster the movement speed.

1.1.2 Movement form of muscles

The movement of the muscles is the contraction of the muscles.

During muscle contraction, myosin filaments and myosin filaments slide relative to each other within the troponin. The needs of the muscle work determine the amount of sliding. Muscle contraction can manifest as a change in length (or no change) in the length of the entire muscle.

If classified by the change in length of muscle contraction, there are four types of muscle contraction:

The first, concentric contraction.

A contraction in which the length is shortened when the skeletal muscle contracts is a concentric contraction.

The characteristic of this contraction is that the contraction shortens the muscle, and the starting and ending points approach each other, causing the body's movement.

Because the tension in the muscle remains essentially constant during the contraction, a concentric contraction is also known as an isotonic exercise. It is sometimes called a dynamic or phasic contraction.

If the distance between muscle initiation and termination shortens during contraction, it is called isotonic shortening or concentric contraction. In actual training, this kind of contraction is used the most; if the distance between the starting and ending points of the muscle is gradually increased and extended during the movement, it is called isotonic lengthening or eccentric contraction. Its function is mainly to control the speed of movement or limbs falling, which is common in Taijiquan sports.

The second type, isometric contraction.

Muscle contraction produces tension without changing the length, called isometric contraction, also known as static contraction. That is, the distance between the starting and ending points of the muscle does not change during contraction. Although the length of the muscle fiber is slightly shortened, the tendon is slightly elongated. Hence, the muscle length is unchanged, and the joint movement does not occur, but the muscle tension increases significantly.

In everyday life, isometric contractions are often used to maintain specific positions and postures.

Isometric exercises in exercise therapy can effectively enhance muscle strength. In addition, when the joint cannot or is not suitable for movement. For example, after a plaster cast or splint fixes a fracture, or there is trauma, inflammation, swelling, Etc., isometric exercises can also be used for static contraction to delay and reduce muscle disuse atrophy.

It is worth mentioning that the isometric contraction of in-body muscles differs from that of isolated muscles. Muscles not only contract isometrically when resisting excessive loads. For example, when trying to pull up a barbell that cannot be lifted, the biceps contraction is an isometric contraction. Moreover, when other joints move under the regulation of muscle eccentric contraction or concentric contraction, isometric contraction can keep some joints in a particular position and create suitable conditions for the movement of other joints.

In short, specific muscles must be contracted isometrically to maintain a particular posture.

The third type, eccentric contraction.

The contraction in which the muscles are lengthened while contracting to create tension is called an eccentric contraction: When squatting, the quadriceps are stretched to control gravity's effect on the body. Make the body squat down slowly to play a buffer role. This centrifugal work on the muscles is also called retreat work.

For another example, putting heavy objects down, running downhill, and going downstairs requires muscles to contract eccentrically. Eccentric muscle contraction prevents sports injuries.

The fourth type, isokinetic contraction.

Isokinetic contraction refers to the forceful contraction of muscles at a constant speed throughout the entire range of motion of the joint. Since the contraction speed is constant, it is also called isokinetic contraction. The stroke of freestyle swimming is a typical isokinetic contraction.

To carry out isokinetic exercises, special equipment must be used, that is, isokinetic exercisers. The central part of the instrument is the speed controller. The speed controller can ensure that no matter how much tension is generated when the muscles involved in the work contract, the contraction speed is constant and, at the same time, adjustable. In the exercise, the appropriate speed can be selected according to different purposes and requirements. In addition, strength testing and recording devices are used to evaluate muscle strength during exercise. Isokinetic exercises are increasingly playing an important role in strength training.

Comparing several contraction forms can help us better understand their characteristics.

In general, eccentric contractions produce the most significant tension for the same contraction force. The force generated by eccentric contraction is about 50% greater than concentric contraction and 25% greater than isometric contraction. During an eccentric contraction, the muscles contract reflexively when stretched by an external force. In addition, the muscle's parallel and serial components play a role in eccentric contraction. Thus greater tension can be generated. Only the contractile components (muscle fibers) generate tension during concentric contraction. Tension first elongates the elastic component of the muscle before acting on the load. At this time, the muscle tension measured externally is smaller than the tension produced by the muscle. Once the elastic component in the muscle is fully elongated, the tension generated by muscle contraction will all act on the external load. Part of the tension generated by muscle contraction is used to overcome elastic resistance. Thus, less tension is exhibited during contraction.

1.1.3 Muscle and power

Explosive power refers to the maximum working ability the human body completes in a short period.

The amount of force in explosive movements varies. This is because motion can be divided into accelerated and decelerated; the speed and force also change.

The amount of explosive power in sports is affected by many factors:

(1) mass and weight
Generally, the greater the mass, the greater the power;
(2) acceleration
Acceleration is determined by muscle strength; the more significant the muscle strength, the greater the acceleration and the greater the power;
(3) time to do work
The shorter the work time, the greater the power;
(4) distance to do work

The distance of work done in sports depends on the athlete's muscle and bone length and the structure of the movement. Performing the same action at the same speed, taller athletes have longer muscles and bones, a greater distance to work, and greater output power than shorter athletes.

In short, athletes with significant body weight and absolute strength will have high explosive power. The explosive power determined by body weight and absolute strength is absolute. However, the importance of improving absolute explosive power is different for athletes of different sports.

Athletes in throwing events need training to enhance absolute explosive power and increase muscle fitness. However, sprinters and high-altitude athletes must maintain a lighter weight and focus more on training to improve relative strength.

1.2. Major tissues and systems of the human body

1.2.1 Shoulder and elbow joints

Shoulder Joint

The shoulder joint can move around three axes of motion, including flexion and extension, adduction and abduction, internal and external rotation, and circular motion. It is a ball-and-socket joint with a huge movable area.

The clavicle, upper arm bone, scapula, and sternum, combined, are called the girdle of the upper extremity. It is further divided into the sternoclavicular joint and the acromioclavicular joint.

When the joints of the upper limbs perform various activities, other joints also perform activities. The girdle joints of the upper limbs are very similar to the socket joints of the scapula joints. This joint has the largest movable area in the human body, can be reversed, and is extremely unstable.

If a person has poor shoulder stability, the main reason is likely to be weak muscles and bones in this area. The stability of the shoulder joint mainly comes from the large area of musculature covering it. In addition to these muscles, the capsular ligament complex supports the joint.

Movement of the clavicle caused by the sternoclavicular and acromioclavicular joints is often linked to the movement of the scapula. The movement of the humerus mainly accomplishes the movement of the scapula. The comprehensive movement involving the scapula is associated with the movement of the scapula and the joints mentioned above.

The joint activities of the upper limbs include flexion, extension, abduction, adduction, internal rotation, external rotation, horizontal abduction, and horizontal adduction.

Elbow

The elbow joint is between the shoulder and the hand and is the joint in the middle part of the upper limb. The elbow joint comprises the humerus, radius, and ulna. The elbow joint is a compound joint composed of three joints: humerulnar, brachioradial, and ulnar-radial. Among them, the humerus-ulna joint only involves flexion and extension as a pulley. The radioulnar joint is mainly involved in internal rotation and external rotation.

The elbow joint can be flexed, extended, internally rotated, and externally rotated. Flexion reduces the angle of the humerus and forearm joint, and extension restores it from flexion. Internal rotation is the forearm rotation from the anatomical position inward to the downward position, and external rotation is the palm rotation from the anatomical position outward.

1.2.2 Waist

The spine is formed by overlapping various vertebrae, among which there are many intervertebral disc cartilage and ligaments. The spine has 33 vertebrae divided into the following five sections: 7 cervical (head), 12 thoracic (ribs-chest), five lumbar (lower), five sacral (base of the spine), 4 Coccyx (coccyx base).

The adult sacrum comprises 5 sacrums fused into one sacrum, and the coccyx is also composed of 5 coccyxes fused into one coccyx. In this way, the bottom nine vertebrae are very stable; they have no mobility.

As essential features of the spine, four different curvatures can be cited to illustrate. The spine of a newborn baby has a long curved line, forming an L-shaped curved line that bends backward as a whole, but when the baby's head is first raised, it will form a curvature of the cervical spine.

The spine has many different functions, the most important of which are protecting the spinal cord and trunk and supporting the limbs, so the support pole keeps the body upright. The spine is the fulcrum of the visceral system. Considering the load side, it has a mechanical advantage. The spine is also the connecting part of the muscles. It not only fixes the chest girdle (rib girdle) but also acts as a buffer. It also has a small quantity of mobility, combining the tasks of muscular strength and flexibility while providing maximum stability and protection. The range of motion between the connected intervertebral bones is minimal, but the spine's range of motion is extensive in terms of overall motion.

1.2.3 Pelvis and hip

The pelvis comprises the left and right hip bones and the sacrum, forming the hip joint with the proximal femur.

The hip bone consists of the ilium, ischium, and pubic bone. The two pubic bones are connected by fibrocartilage, called the pubic symphysis, the most vulnerable part of football players. The anterior superior iliac spine (the starting point of the sartorius muscle and the iliotibial band) and the anterior inferior iliac spine (the starting point of the rectus femoris muscle and the iliofemoral ligament) are also prone to injury in the front of the ilium.

The tuberosity of the ischia is primarily the origin of the semitendinosus, semimembranosus, long head of the biceps femoris, and adductor major. The ischial rami of the pubic bone is the origin of the other adductors and the gracilis, both vulnerable.

The hip joint consists of the wide socket of the hip bone and the head of the femur, and is a typical ball-and-socket joint. It can perform flexion and extension, retraction, rotation and circular motion around the three motion axes, and the range of motion is extensive.

The shape of the acetabulum is determined in part by the shape of the pelvis. The shape of the pelvis is also determined by gender. The female pelvis is shallow, short, cylindrical, with lighter bones; the pubic bone is acutely angled (wider than average). The femur grows toward the body's centerline opposite the knees, and the hip joint is more expansive than in men and flares out to the outside.

The range of motion of the female hip joint is very plastic, and the legs are easier to split back and forth.

The hip joint comprises the acetabulum of the hip bone and the femoral head. It is deep and surrounded by thick muscles. The joint capsule is tough and reinforced by the hip-femoral ligament at the front and back, so it is relatively stable. Gymnasts, martial arts athletes and acrobatic dancers so-called "pulling the hip ligament" mainly refers to the hip femoral ligament.

This ligament is tight, which is good for stabilizing the joints. However, it can also lead to "hard hips" and "protruding buttocks", which affects the beauty of posture, increases the burden on the waist when "wrapping the waist as a bridge", and causes lamina fractures or vertebral epiphysitis.

In addition to the iliofemoral ligament, there are pubis, ischial and round ligaments in the hip joint. Between the iliac ligament and the pubis ligament, the joint capsule is relatively weak, and the tendon of the iliopsoas muscle covers it to strengthen it. There is a subpsoas bursa underneath, which can produce inflammation and snapping.

The femoral neck is mainly composed of cancellous bone. With blood supply and metabolic disorders, the elderly primarily degenerate and atrophy, the number of trabecular bones decreases, and they are prone to fractures due to external forces, that is, femoral neck fractures. On the other hand, since most of the femoral neck is located in the joint and the blood flows from top to bottom, if the elderly suffer from arteriosclerosis, the femoral neck fracture will not only take a long time to heal, but also often lead to femoral head necrosis.

When the hip joint moves, more muscles are used. Among them, when doing abduction exercises, the gluteus medius, gluteus minimus, and iliotibial band will be used; when doing external rotation exercises, the quadratus femoris, quadratus femoris, piriformis, and iliopsoas muscles will be used; when doing flexion exercises, the iliopsoas is used; when doing medial exercises, the tensor fascia lata (iliotibial band) and the anterior bundle of the gluteus medius are used. When a person is standing, the exertion of the iliopsoas, pectineus and upper adductor muscles will externally rotate the upper body and pelvis, and at this time the hip can be relatively internally rotated. Therefore, this group of muscles is also a critical hip internal rotation muscle in the process of running and jumping; when doing adduction exercises, the adductor muscles and the pubic muscle are needed; when doing back extension exercises, the gluteus maximus is needed.

1.2.4 The knee joint and its ligaments

Knee Joint

The knee joint is a weak joint that supports the body and is located at the upper end of the lower leg. The key to understanding knee injuries is understanding how it moves.

The knee joint mainly comprises the femur's lower end and the tibia's upper end. The patella is accessible on the surface of the femur, connected to the distal end of the quadriceps muscle through the ligament, and connected to the tibial tuberosity below.

The knee joint comprises three bones: the patella, femur, and tibia.

The knee is the most representative elliptical pulley joint.

Structurally, the position of the patella is precarious, mainly relying on the assistance of ligaments and muscles to withstand external forces and support the body. Functionally, the weak point of the knee is that two sets of muscles control each part. In addition to slight internal and external rotation of the tibia, the knee joint can only do a specific range of flexion and extension.

During stretching, both the tendon and the rectus femoris are affected. The intense activity of these two muscle groups simultaneously can lead to injury.

The knee joint muscles are divided into three groups: front, outside, and inside.

On the front is the quadriceps, the leading "equipment" for knee extension. When the quadriceps contracts, it pulls the patella upward, which can prevent the patella from slipping outwards. It can also tighten the anterior knee aponeurosis, preventing the fat pad from being embedded in the joint space.

Since the quadriceps femoris is at the knee flexion position of 30° and 150°, the resultant force is the largest. At this time, the moment between the patellofemoral also reaches the maximum. Therefore, force-generating movements such as stepping and jumping, "kicking after throwing" when throwing, Etc., all use this force-generating angle.

The lateral knee muscles include the biceps femoris, popliteus, and iliotibial band.

The primary function of the biceps femoris is to flex the knee and externally rotate the calf; the iliotibial band mainly acts as an "auxiliary" for knee extension; the popliteus fixes the meniscus and stabilizes the knee joint.

The knee medial muscle consists of the sartorius, semi-visceral, and gracilis tendons to form the "goosefoot." Together with the semimembranosus, the calf can be internally rotated to prevent external rotation and instability of the knee.

Ligament

There are two ligaments in the knee joint: intra-articular and extra-articular. The former is the anterior and posterior cruciate ligament, and the latter is the knee's medial and lateral collateral ligament.

Two cruciate ligaments in the knee are mainly responsible for preventing the tibia from moving back and forth or knee rotation instability. When the knee is half-bent, the ligaments will loosen slightly, and when the knee is fully extended, both will be tensed, and the joint is in the most stable state.

The lateral collateral ligament is cylindrical, originating from the lateral epicondyle of the femur and inserted on the head of the fibula. There is no connection between the ligament and the meniscus, separated by the pine connective tissue. The popliteal tendon underlies the lateral ligament and is contained within the joint's synovium. When the knee is bent, the ligament is loose, and when it is stretched to 150°, it becomes tense, and the tension is the highest when straightened, which can prevent the adduction and rotation of the calf.

The medial collateral ligament is fan-shaped and divided into two layers, deep and shallow, including longitudinal and oblique fibers. The deep layer is located above and below the joint space, is shorter, and is closely connected with the outer edge of the middle and posterior part of the meniscus. In the superficial layer, the anterior longitudinal bundle is more prolonged, starting from the medial epicondyle and the adduction tuberosity and ending at about two transverse fingers below the tibial condyle under the goosefoot. The posterior superior oblique bundle originates from the posterior portion of the anterior longitudinal bundle, descends to the posterior border of the medial tibial condyle, and extends to the meniscus. The posterior inferior oblique bundle is at the lower end of the semimembranosus tendon. The function of the front longitudinal bundle is to prevent knee abduction. The knee is tense in full extension and full flexion and is only slightly relaxed when it is at 150°. The two rear oblique bundles prevent knee rotation instability.

1.2.5 Foot and Ankle

Foot

The foot is a bow-shaped structure with elastic force, similar to a car's suspension system.

The foot joints, ligaments, muscles, Etc., gather on the soles of the feet to form the arch, which acts as a buffer and makes the foot flexible.

A balanced arrangement of muscles and tendons determines the curvature and inclination of the foot, such as a concave foot, a hooked foot, or a high arch. The main functions of the foot are dorsiflexion and flexion.

The bone structure, joint structure, fascia, ligaments, muscles, and support of the waist determine the joint range of motion of the foot.

Due to the structure of the plantar aponeurosis, wearing hard shoes for a long time can easily cause foot injuries.

Ankle

The ankle, also known as the suprasellar joint, is primarily a butterfly joint composed of the tibia, fibula, and talus. The three are supported by fibrous joint capsules, ligaments, and tendons and are composed of the anterior talofibular ligament, posterior talofibular ligament, calcaneofibular ligament, and medial triangular ligament.

The functions of the ankle joint mainly include valgus, varus, dorsiflexion, and plantar flexion. The bone structure, joint structure, fascia, ligaments, muscles, and fascia support determine the range of motion.

The ankle joint is a varus structure, and varus injuries cause most ankle contusions.

1.2.6 Wrist

The wrist joint is very stable. The function of stability is due to multiple tendons and ligaments in the transverse section of the wrist. This stability also comes from the alignment of the bones.

Wrist flexion, extension, valgus, varus, and circumflex motions. The flexion of the wrist joint means that the movable area is between 0° and 90° when the center of the palm pulls toward the forearm. The extension of the wrist joint is the movement of the palm away from the forearm, and the extension range is between 0 and 85º. The valgus of the wrist joint is the bending of the forearm in the direction of the ulna; mainly, the metacarpophalangeal joints are in play, and the range is between 0 and 15º. The varus of the wrist joint is to bend toward the radial side of the forearm, mainly due to the flexion of the wrist joint and the scaphoid bone, and the varus range is between 0° and 45°.

1.2.7 Calf

The part between the knee and ankle joint is the lower leg.

Its structure is very similar to that of the forearm of the upper limb, consisting of the tibia and fibula. The interosseous muscles connect the two bones, and there are many muscles around them.

The calf muscles are located at the lower back of the leg and consist of superficial gastrocnemius, soleus, and heel muscles and deep popliteus, flexor hallucis longus, flexor digitorum longus, and posterior femoral muscles.

Among them, the main functions of the superficial muscles are plantarflexion (extension) of the ankle joint and flexion and extension of the knee; the main functions of the deep muscles are flexion and extension of the toes and inversion of the foot.

The peroneus longus is the outermost muscle, and the medial and lateral comprise most of the calf muscles.

The soleus is a broad, flat muscle deep and slightly anterior to the peroneus longus. Together, the peroneus longus and soleus are known as the triceps calf. Nearly 10% of the total flexion and extension of the muscles in the back of the leg depends on the triceps calf.

The tendon of the ribs longus and the purpura is called the Achilles tendon.

The Achilles tendon is vast and robust in the body. It attaches to the back of the calcaneus and can withstand a force of about 3200 kg per 1 cm.

The muscle group on the front of the calf is mainly composed of four muscles. The most representative tibialis anterior muscle is located on the outermost side of the tibia. In addition, there are extensor hallucis longus, flexor digitorum longus, and peroneus brevis. The first two muscles play the role of assisting dorsiflexion and plantar flexion.

The muscles on the outside of the calf are called the lateral muscles, and its muscle group is composed of two kinds of peroneal muscles, long and short. Although both play an auxiliary role in the eversion of the feet, the former can make the foot plantar flex.

1.2.8 Thigh

The thigh is between the hip and knee and has only a single femur.

The femur is the strongest and longest bone in the human body, surrounded by many muscles. On the front of the thigh are the rectus femoris, vastus medialis, vastus lateralis, intermuscularis, and sartorius muscles that make up the quadriceps, the tensor fascia lata, the aponeurosis of the buttocks, and the iliotibial ligament.

The quadriceps is known as the quadriceps muscle and has been given various names due to the location of the various parts. The rectus femoris is located on the uppermost layer of the femur, the vastus lateralis is on the outside of the thigh, the vastus medialis is on the inside of the thigh, the inter muscle is located between the thigh muscle and the rectus femoris, and the sartorius crosses on the femur.

All quadriceps flex and extend the knee, but the rectus femoris also flexes the hip. On the contrary, the sartorius muscle can flex both the tendon joint and the knee joint and externally rotate the calf when the foot leaves the ground. Also, the tensor fascia lata assists in hip flexion and extension to internally rotate the femur.

There are three muscles in the back of the thigh, the biceps femoris, semitendinosus, and semimembranosus. These three muscles are commonly referred to as the popliteus tendon.

The biceps femoris is on the outside of the thigh, the semitendinosus is on the inside of the back of the thigh, and the tendon is very long. It can be seen from the text that half of the muscle is the key. Another is that the semimembranosus is distributed on the inner side of the back of the thigh. Because the upper junction of this muscle presents a very smooth membrane, it is called semimembranosus.

The maximum movement of the popliteus tendon is knee flexion and hip extension. When the hip is flexed, or the upper body is leaned forward, the popliteal tendon acts as a supporting muscle against gravity. The biceps femoris becomes an external rotator when the knee is semiflexed, and the other popliteus tendon becomes an internal rotator of the thigh. The biceps femoris externally rotates the femur during hip extension, and the other popliteus tendon acts as an internal rotator.

In the deep layer of the thigh, there are five muscles, including adductor brevis, adductor longus, adductor magnus, gracilis, and pectineus. The groin mainly refers to the upper front of the thigh and the lower abdomen. The adductor muscle, called the inner thigh muscle group as a medical term, is also named after the composition and function of the body, like other muscles. The main functions of the inner thigh muscles are adduction, flexion, and internal rotation of the femur. On this basis, together with the ligaments of the hip joint, it limits its abduction.

The anatomy of the lower extremity bones is due to the difference in the axis, and the pulling force generated from the upper part of the leg, the knee joint, and the ankle joint are in a straight line. In women, because of the wider pelvis, when the tibia is angled outward, the thigh is slightly flexed, involving the knee valgus. Usually, genu valgus requires the knee to be in flexion.