

Experimental progress of acupuncture in enhancing knee muscle strength

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Abstract: For athletes undergoing sports training, for the joint pulled by large muscle groups, enhancing the muscle strength at the joint and recovering sports injury has been an important premise to improve athletes' sports level. It is found that the acupuncture effect has a significant effect on the growth of muscle strength, and has the phenomenon of cross migration, which is different from the traditional training mode; The effect of ordinary resistance training is similar or even better.

Keywords: Knee Joint, Resistance Training, Acupuncture Acupuncture Effect, Cross Migration, Equal Muscle Force

This paper will investigate this phenomenon through experiments and carry out traditional training methods for athletes respectively; General resistance training, and the training methods found in the latest research; The effect of acupuncture and acupuncture is evaluated and tested for the joint by using isomed2000 isokinetic muscle strength testing and training instrument, so as to draw a conclusion that the effect of acupuncture and acupuncture is similar to that of ordinary resistance training, so as to study a new way of muscle training.

For joints often used in training or competition, enhancing the muscle mass strength around the joint, restoring sports injury, and slowing down muscle fatigue plays a very important role in athletes. But the athletes in the injury rehabilitation period, ordinary resistance training, massage therapy to strengthen the sports level of athletes, injury recovery, and it is a drop in the bucket.

Taking the knee joint as an example, the knee joint plays an indispensable role in various small ball sports such as ice and snow sports, cycling and tennis. When the knee joint is not properly trained and muscle fatigue occurs, it is very easy to cause injury, and the movement mode of the joint is closely related to the contraction of large muscle groups such as quadriceps femoris and biceps femoris, so the training of athletes after sports injury Recovery is also difficult.

Because the research found that the acupuncture effect of acupoints has a significant effect on the growth of muscle strength, and has the phenomenon of "cross migration". If this phenomenon can be applied to sports training, it will add a lot of color to the training methods of each sports team.

1. Physical characteristics of knee joint

1.1. Structure of knee joint

The knee joint is a trochlear joint, which is formed by the joint of femur, patella, tibia and three bones, thus forming the joint with the largest and most complex joint space in the human body. Therefore, the joint capsule attached to the periphery of each bone and joint cartilage of the knee is thin and loose. Ligaments are reinforced at all angles around the joint capsule. The anterior, posterior, medial and lateral sides of the knee joint are reinforced by patellar ligament, tibiofibular collateral ligament, popliteal ligament and. At the upper edge of the patella, the suprapatellar capsule is presented in a cystic structure about 4 cm above the synovium. The pterygoid fold is located on both sides of the lower part of the patella. The synovium forms a fold and goes deep into the joint cavity. The fold is filled with fat and blood vessels.

1.2. The importance of the knee joint to the sports level and performance on the field

The periphery of the knee joint is connected with the muscle group composed of multiple muscles.

In each muscle, the starting and ending points are respectively located at the anterior superior iliac spine and the upper end of the tibia, which are installed in a flat belt through the front of the thigh and inclined downward. The sartorius muscle located at the inner side of the upper end of the tibia plays an important role in the flexion of the knee joint and the rotation of the knee joint in the existing flexion position. In addition, biceps femoris and quadriceps femoris, each head of the front and rear muscle groups crosses the knee joint, so that the knee joint can perform flexion, extension, pronation and external rotation. In competitive sports, running, jumping, throwing and other movements are closely related to the flexion and extension, internal rotation and external rotation of the knee joint, and the knee joint, as the axial joint to buffer the pressure in jumping, is very easy to be damaged. Therefore, enhancing the stability of the knee joint and strengthening the strength of the knee muscle plays a vital role in the athletes' sports level and performance on the field.

1.3. Reasons for evaluation using the IsoMed2000 isometric muscle strength test trainer

Isomed2000 isokinetic muscle strength testing and training instrument is made in Germany. The training system can produce the maximum muscle tension in the whole range of motion. It can not only meet a large number of tests and training of athletes, but also evaluate the joint from the tested indexes. It has a wide range of applications.

Isokinetic muscle strength test is the gold standard for muscle strength test evaluation [1] It has the characteristics of safety, effectiveness, high repeatability and stable and accurate results [2], can be widely used in the fields of diagnosing athletes' sports ability, formulating reasonable strength training, injury prevention and sports rehabilitation for athletes. Therefore, the tester is used to test and select competitive athletes to test and evaluate the joint, so as to provide an important basis for the conclusion.

2. Comparison and analysis of the training methods

2.1. General impedance training

Ordinary resistance training, in the field of fitness, mostly adopts extensive isometric or isotonic training, and uses effective resistance training methods or schemes to enhance the muscle strength around a joint, so as to improve the athletes' sports level.

Isometric training is widely used in muscle strength training, such as lifting dumbbells, lifting sandbags, etc. isometric training is also known as static exercise, which is the static contraction of muscles in one state, and the joints wrapped by muscles do not perform flexion and extension and other activities. The above two training methods are simple and effective, so they are mostly widely used in sports training and competitive sports.

2.2. Acupuncture acupuncture training

Acupuncture and acupuncture training refers to the acupuncture method of traditional Chinese medicine. The needle is inserted into a certain acupoint of the human body according to a certain angle to stimulate the corresponding specific part. Acupuncture and acupuncture is also one of the main components of traditional Chinese medicine. Acupuncture and acupuncture training combines traditional Chinese medicine with sports training, energizes the nervous system through acupuncture and acupuncture, and uses small current to stimulate the nervous system, Rhythmic contraction of muscles can promote local muscle blood circulation and increase muscle strength.

Acupuncture and acupuncture can also be used in the early stage of injury: braking period and injury rehabilitation period. At present, a large number of studies have found that after 4-12 weeks of unilateral muscle electrical stimulation, it can not only increase the muscle strength of the training side, but also significantly increase the homologous muscle strength of the opposite side, compared with random centrifugal contraction, Unilateral training with muscle electrical stimulation can significantly increase the muscle strength of the limbs on the training side and untrained side. In the same training cycle, the muscle strength of the limbs with electrical stimulation training increases by 177%, that of the sides without electrical stimulation training is 104%, and that of the muscles with random contraction after ordinary resistance training increases by 54% and 23% respectively [3], this phenomenon is also known as cross migration.

3. Results and analysis

3.1. Subjects and groups

In this experiment, 30 male athletes were recruited. Two different training schemes were adopted. They were divided into two groups: 15 people in group A and 15 people in group B (general resistance training in group A and acupuncture effect training in group B). They were trained for 6 weeks respectively, three times a week. Before and after the experiment, isomed2000 isokinetic muscle strength test and training instrument was used to test and evaluate the knee joint. See Table 1 for basic information

Table 1: Basic Information of the Subjects 30 (Person)

Group	height (cm)	body weight (kg)	Age (y)
General Impedance Training Group (Group A)	180.50±5.12	67.70±4.67	22±3
Acupuncture Acupuncture Training Group (Group B)	180.40±5.55	66.82±5.22	22±3

3.2. Common resistance training scheme and the results and analysis of 60 %/s

3.2.1. training program

The weight-bearing training method in the ordinary resistance training, using the isotonic contraction method, load 60gk, squat and get up quickly, 9 times in each group, 5 groups each time, the interval between groups is 3 minutes, and train once every other day or two days for 6 weeks

3.2.2. Test results and analysis

After 6 weeks of ordinary resistance training, through the isomed2000 isokinetic muscle strength training tester, it is found that the knee flexor and extensor muscles of the subjects have significant differences compared with those before training ($P<0.05$), indicating that ordinary resistance training is positive and effective in improving the athletes' sports level. See Table 2 for basic information.

Table 2: basic information after resistance training

Muscle group	Centripetal before trainingPT (N M)	Centripetal after trainingPT (N M)
The knee flexor group	175.11±35.31	198.68±35.73 ^c
The knee extensor muscle group	225.12±41.91	269.30±48.98 ^c

Note: ^c means $P<0.05$ compared with ipsilateral homonymous muscle, and ^d means $P<0.01$ compared with ipsilateral homonymous muscle

3.3. Scheme of acupuncture effect and analysis of 60 %/s

3.3.1. training program

Using acupuncture effect, acupuncture points Zusanli and Xiajuxu, two-way square wave, 50Hz, 200us intermittent wave(15:5s) withstand strength lasts for 30min/time, 1 time/D, 5 times/W.

3.3.2. Test results analysis

After six weeks of current acupuncture and moxibustion, it was found that the strength of knee flexor and extensor muscle increased significantly ($P<0.05$) by using the training program of acupuncture and moxibustion Acupoint Zusanli and xiajuxu, two-way square wave, 50Hz, 200us intermittent wave (15:5s) tolerance intensity for 30min/time, once/D, 5 times/W, The sports level of athletes has improved. See Table 3 for basic information.

Table 3: Basic information after acupuncture treatment

Muscle group	Centripetal before training PT (N M)	Centripetal after training PT (N M)
The knee flexor group	185.31±25.21	208.68±35.03 ^c
Knee extensor muscle group	223.12±42.61	265.30±44.98 ^c

Note: ^c means $P<0.05$ compared with ipsilateral homonymous muscle, and ^d means $P<0.01$ compared with ipsilateral homonymous muscle

Conclusion suggestion: through the study, it is found that the training program of six weeks of

acupuncture and moxibustion at Zusanli and Xiajuxu, two-way square wave, 50Hz, 200us intermittent wave (15:5s) tolerance intensity for 30min/time, once/D, 5 times/W has a significant increase in muscle strength compared with ordinary six weeks of resistance training ($P<0.05$).

Moreover, a large number of scholars have found that the acupuncture and moxibustion effect also has the phenomenon of cross migration, which can not only improve the muscle strength of the training side, but also improve the muscle strength of the corresponding untrained side. Compared with the random centrifugal contraction, the unilateral muscle electrical stimulation training method has obvious progress in increasing the muscle strength of the training part and the untrained part. Through research, it is found that in the same training cycle, The increase of muscle strength in electrical stimulation training was 177%, that in the side without electrical stimulation training was 104%, while the increase of muscle strength in random contraction in general resistance training was 54% and 23% respectively.

With the rise of sports fever, more and more people participate in sports training and competitive sports. As one of the main joints to alleviate the impact, strengthening the muscle strength around the joint is also an important premise to improve athletes' sports level and prevent knee sports injury.

In the event of sports injury, the ordinary resistance training is greatly limited, which is unable to improve or maintain the sports level of athletes, while the acupuncture effect perfectly avoids the injury period of athletes.

Compared with the boring repetition of ordinary resistance training, acupuncture and moxibustion effect can provide athletes with a lot of self-control time, and the cross migration phenomenon of acupuncture and moxibustion effect is very obvious. If acupuncture is applied on both sides at the same time, the growth of muscle strength will be doubled. In view of the above conclusions, the study concludes that acupuncture and moxibustion effect is also applicable to muscle strength training, Moreover, using isomed 2000 isokinetic muscle strength test and training instrument, it is found that the training scheme has a significant increase in the improvement of athletes' sports level ($P<0.05$). The program can also fill the training gap of athletes in the period of sports injury.

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