

The Effect of Isometric Training for *the Quadriceps Femoris* and *Triceps Surae Muscles* on the Ability to Jump Long Without Starting in Class XI MAN 1 Surakarta Students

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Abstract. Athletics, as a very popular individual sport, is taught in high schools (SMA). Sport helps improve the functional development of all five senses, because during sport students are trained to be able to understand commands, rules of the game, work together, find solutions and seek goals. Long jump is a form of jumping movement lifting the legs up in front in an effort to carry the center of body weight as long as possible in the air or floating in the air which is done quickly and by pushing off one leg to reach the greatest distance possible. This research method uses experimental with "one group pre and post test design with control". The subjects of this research were 64 students of class XI MAN 1 Surakarta.

Keywords: Athletics, *Quadriceps Femoris* and *Triceps Surae Muscles*, Long Jumping Without Starting.

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INTRODUCTION

Background Behind the Problem

Athletics is one of the most popular sports in the world. Athletics includes running, walking, jumping and throwing numbers . About 200 countries are registered in *the International Amateur Athletic Federation* (IAAF) or Athletics Federation Amateur International. At every Olympics, the most contested sports are is Athletics (Irwansyah, 2006). Athletics is branch The oldest sport and is the parent of all sports movement is a variety and basic movement patterns of human life which consist of dynamic and harmonious movements such as walking, running, throwing and jumping (Djumidar, 2007).

Athletics as sport individual Which very popular This taught in schools from elementary school (SD) to high school (SMA). Apart from that, athletics is the parent of sports, because of the movements in Athletics covers movement Which done in life daily for example run, road, jump, And throw (Wiarto, 2013).

Based on *Webster's New Collegiate Dictionary* (1980) sport is participation in physical activity for enjoyment, and activity special like hunt or in sport match. Sport is also a barometer for the progress of a nation, with good sporting achievements will certainly be a matter of pride for you a nation, therefore the creation of quality human resources in the field of sports should be started early in order to achieve development and performance sport Which optimal (Robikeane, 2011).

In field sport, For reach performance Which Good, level Good physical fitness is a requirement that should not be ignored. This matter because good physical fitness can improve performance and reduce the possibility of injury (Moeloek, 1984). Physical fitness is a degreeA person's health is the basic physical ability to be able to carry out activities task Which must implemented (Giriwijoyo, 2012).

The United Nations or UN considers physical education andsport important Because can support for achievement *Millennium Development Goals* (MDGs) in the fields of health, education and poverty. In this case physical education and sports can be an instrument effective for countermeasures And enhancement in a way No direct problem health And poverty (Ministry of Youth and Sports, 2005).

LITERATURE REVIEW

A. Anatomy give functional Otot *Quadriceps of the thigh* give *Triceps suras*

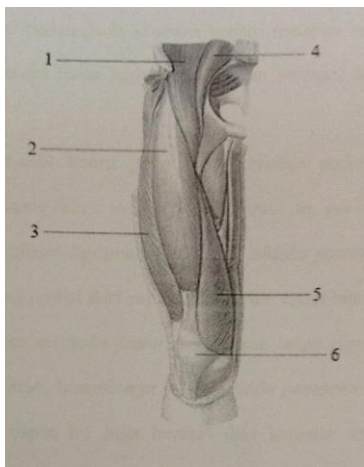
quadriceps femoris muscle is the anterior thigh muscle. *Quadriceps* muscle *femoris* consists of four part, that is (1) *m. rectus femoris*, (2) *m. vastus intermedius*, (3) *m. vastus medialis*, (4) *m. vastus lateralis* . These four muscles unite to form tendon together which inserts on *patella* . From distal *patella* , tendon next as *ligament patellae* And insert on tibial *tuberosity* . The superficial fiber tendons run across *the patella* , while the deep tendons insert on edge above and laterally. Some fibers *m. vastus medialis* and *m. The rectus femoris* forms *the medial retinaculum patellae* , and *m fibers. vastus lateralis* and *M. rectus femoris* forms *retinaculum patellae laterale* . The retinacula runs distally around *the patella* to *the condyle tibiae* (Platzer, 1991).

Muscle *triceps surae* role in movement plantar flexion wrist foot. *M. triceps surae* can support body weight when standing or standingwalk (Platzer, 1991). Apart from that, the auxiliary muscles play a role in the plantar flexion movement ankle, including: *m. peroneus brevis*, *m. peroneus longus*, *m. flexor hallucis longus*, *m. flexor digitorum longus*, *m. tibialis posterior* (Luttgens, 1997).

M. gastrocnemius consists of a medial head and a lateral head. Origin of head mediale is located on *the medial condyle of the femur* , while *the origin of the head laterale* lies on *condyle lateral femur* . The insertion located on *posterior os calcaneus* . Some of the fibers from these two heads also originate from the joint capsule knee. Both heads the walk to direction distal, forming edge inferior fossa poplitea, and unites with the tendon of *m. soleus*. *M. gastrocnemius* is innervated by *n. tibialis* branch S 1-2 (Platzer, 1991).

m soleus berorigo on surface *posterior capitulum fibulae*, *1/3 proximal fascies posterior fibulae*, *linea poplitea*, and middle *1/3 of margo medialis tibiae*. Tendo wide terminal from muscles unites with tendons terminal *m. gastrocnemius* and inserts on *the tuber calcanei* as *the calcanei tendon (tendo Achilles)* . Between the proximal surface of *the tuber calcanei* and this tendon is located exchange tendon calcanei. Muscle This innervated by *n. tibialis* from S 1-2 (Platzer, 1991).

M. plantaris is a small, soft muscle with a terminal tendon the long one. Its origin is from *the popliteum femoris* , terminating as a tendon, runs on the medial side of the calcaneus tendon, and inserts on *the os. Calcaneus* . This muscle Also innervated by *n. tibialis* from S 1-2 (Platzer, 1991)



Draw 2.1

Otot *Quadriceps of the thigh* (Putz, R and Pabst R 1994)

Description gambar 2.1

M. Iliacus

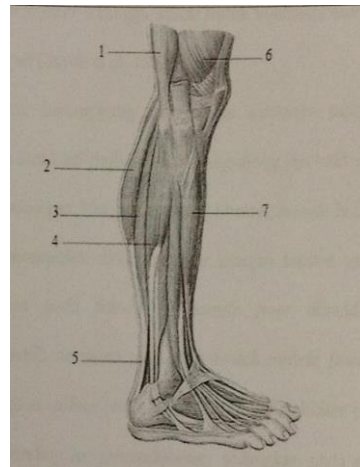
M. Right of the thigh

M. Waste Lateral

M. Psoas Major

M. Waste medial

plate



Draw 2.2

Tot *Triceps Surae* (Putz, R and Pabst,R 1994)

Description gambar 2.2

M. Biceps Surahs

M. Gastrocnemius

M. Soleus

m Peroneus longus

Tendo m. Gastrocnemius

m Vastus lateral

m Tibialis anterior

B. Physiology Muscle And Corner Pull Muscle

Physiologically, *m. The quadriceps femoris* functions for knee extension and dominant in *fast twitch fibers* so it is suitable for strong muscle contractions but short like jump (Smith *et Al* , 1995).

triceps surae muscle is responsible for the strength of the lower leg. *m gastrocnemius* Work moment foot tiptoe with edges finger foot as support, walking, running and jumping. In every normal person, *muscle belly* or muscle bellies contract by shortening and expanding with tendons long. *m gastrocnemius* dominant on *fast-twitch muscles fiber* compared with *M. soleus* . Meanwhile *m. soleus* is more dominant in *slow-twitch muscles fiber* compared *m. gastrocnemius* , so that *m. soleus* more used For stability wrist foot And posture controll compared *m. gastrocnemius*, while in *m. The gastrocnemius* plays a more important role in activities that require it speed reaction like run And jump (Smith *et Al* , 1990).

In general, muscle fiber types can be divided into two groups, namely: fast muscle fibers (*fast-twitch fibers*) and slow muscle fibers (*slow-twitch fibers*). Most of the muscles in the body are composed of both types of muscle fibers This is even though some dominant muscles are composed of one type of muscle fiber. The percentage of fiber types is greatly influenced by genetics, internal hormone levels blood, And activity exercise somebody (Adhiartha, 2009).

On fiber muscle type slow / *slow – twitch – fibers* / type I / *slow-oxidative* ,contains a lot of myoglobin, surrounded by blood vessels Lots, And own enzyme oxidative (mitochondria) Which Lots, own fiber contractile Which more slow from type II, And own ability produces lower power. This type of *slow fast twitch fiber plays a role* in strength and power muscle endurance, and have more efficiency tall (Adiartha, 2009).

Meanwhile, in fast type muscle fibers / *fast - twitch fibers* / type 2 / *fast- glycolytic fibers* , own content enzyme glycolytic Which Lots, amount mitochondria A little, ability more contractions big of type 1, speed contraction is higher because the ATPase is highly active. *Fast twitch fiber* has a larger size than *slow twitch* and has a larger motor neurons And can produce energy Which more big, as well as role in speed contraction muscle (Adiartha, 2009).

Another type of muscle fiber is the *intermediate type / intermediate fibers / fast-oxidative glycolytic fibers*. Type This has characteristics biochemistry And contractile in between second group muscle previously, own characteristics a mixture of the other two types of muscles, and has a high adaptability (Adiartha, 2009).

C. Jump Far Without Prefix

1. Definition

Jump Far is Wrong One branch Athletics Which aim reach distance leap as far as possible. Jump Far is combination from speed (*speed*), strength (*strength*), flexibility (*flexibility*), endurance (*endurance*), and accuracy (*accuracy*). In the long jump, there are 2 techniques that can be done, namely long jump with a start or running stance , and long jump without a start (Istiqomah, 2009).

The definition of the ability to jump long distances without a start is a series movements that begin with bending the knees by swinging the arms, pushing, floating, And land. Movements in jump Far the must done in a way Good And harmonious No disconnected its implementation so that obtained leap as far as possible (Chu, 1992).

The long jump with a start involves elements of running speed, whereas jump Far without prefix No involve element speed run. So that on jump Far without prefix, stages or phase Which happen that is : depart/concentrate, Flying, And land (Muller *et Al* , 2000).

The various styles that can be used in the long jump are: (1) style squatting or sit-gliding or truck (*kauer*), (2) gait in the air or lauf (*walking / running on the water*), (3) style hang or bouncy or *Schnepper / hangs* (Pandjaitan, 1992).

Tools that can be used in the long jump are: roll meter or measuring tape, and a small flag. A roll meter or measuring tape is used to measure the distance jump, the method is to measure the distance starting from the beginning of the foot support on the beam focus until with focus foot moment First time land.

2. Components jump away without prefix

Factors base for something performance jump Far that is : (1) factor condition, namely speed, jumping power and goal directed skills, (2) factors of stance technique, jump preparation and transfer, floating phase and landing (Bernhard, 1993).

However, in the long jump without a start, the factor is taking stance with running not done, only the jumping power factor is influential. Jump power especially appears in the upward force when jumping. To increase jumping power, there are 2 ways of training that can be done, namely: practice without burden, And exercise with burden (Bernhard, 1993).

Method do beginning jump Far without prefix is as following : (1) jumper stand with second foot Which parallel in behind line start repulsion, (2) the jumper squats slightly, where the knees should not be flexed more than 45° , the feet placed on beam jump Far or sign line, arm straightened out to back, (3) jump or push forward as far as possible accompanied by swing the arms from both hands, (4) then land on both feet, (5) The result is measured from the line

of repulsion to the closest surface touched by body (Dwikusworo, 2000).



Picture 2.3 Phase Jump Far Without Prefix (Chu, 1992) Phases jump :

A. *Take off / leaving*

Departing is an important movement to determine the outcome perfect jump. When leaning / leaving, it is best not to let your body rest too inclined. Focus must be strong, fast and active, body balance too keep it from shaking. Body weight slightly in front of the fulcrum, leg movement step from heel to toe, at a fast tempo. Swing movement The arms really help increase height and also maintain balance body. In the lifting or lifting stage, the jumper generates speed vertical (Istiqomah, 2009).

The jumper prepares for *take off* by moving the hips upwards Then hip to lower going to phase *take off* . Must emphasized that hip moved to lower And step adjustment all happen consequence from the jumper's postural adjustments in preparation for *take off* . At the time of *take off* make sure hip A little to front from shoulder (Istiqomah, 2009).

When you *take off*, your feet are placed on the board, your feet are slightly forward from the jumper's hip and must support the board on the center line. The footing must be level only then *take off* . The head should be in a normal position, parallel to the bones behind, And eye must focused to front And A little to on (Istiqomah, 2009).

a. *Flying*

Speed and power are generated during *take off* . After the jumper *take off* tend rotation to front, If No repaired, will result foot touches the sand early and the resulting distance is not optimal. Movement Forward legs and arms are done to prevent the jumper from leaning rotation to front (Istiqomah, 2009).

b. *Land*

During landing, jumpers aim to get their heels as far away from the take-off board as desired. Ideal landing position shown in the opposite diagram where the dotted line represents the path

projected flight of the body from the center of gravity. Heels are necessary touch land appropriate before track flight Which projected For ensure the jumper does not fall back into the sand. When the foot makes contact with sand, press heel to lower And thigh back of the contract causes hips up. When hips twist they go on to One side And let momentum to front For bring body pass position landing (Brian Mac, 2010).

3. Physical condition factors that influence the ability to jump long without prefix
In do something exercise must is known factors Which influencing or providing a role in achieving maximum performance in branch sport Athletics specifically jump Far. On jump style squat the factors that influence against achieving long jump results without prefixes include, among other things, components of physical condition in the form of muscle strength, powerexplode muscle, type sex, age, And Index Mass Body (BMI).

a. Strength muscle

For can contract maximum determined by big small cross section of the muscle, the number of muscle *fibrils* that work in the fight load, size of body frame, muscle *innervation* both central and *peripheral*, the state of chemicals in muscles, age and gender. (Suharno, 1986 quoted Rossy 2009).

Big small muscle truly influential to strength muscle. A person who has long bones but does not have much strength. The more big muscle somebody increasingly strong also muscle the. Factor size This, GoodIts size and length are greatly influenced by heredity or heredity. Although there is evidence that muscle strength training can increase the number of fibers muscles, but physiologists argue that muscle enlargement is caused by increase breadth fiber muscle consequence something exercise (Sajoto, 1988).

Muscle strength can be defined as muscle power or tension to carry out repetitive or continuous work against prisoners in a maximum effort. Muscle strength is the ability to produces power, including dynamic or isotonic power (ie ability For produce power through scope motion) And isometric strength (i.e. the ability to produce force at a point in scope motion without accompanied change long muscles) (Utari, 2007).

Strength consists of two types, namely: (1) maximum strength is the muscle's ability to contract maximally and the strength to resist or withstand the maximum load as well, (2) explosive power is the ability of aa muscle or group of muscles to overcome load resistance at high speedin One movement Which intact (Sajoto, 1988).

Strength is an important factor in the long jump, because is an important element, so strength needs to receive special attention in implementing the training program. The element of strength in the long jump is very important to get a strong and correct shot so that you can do it

too make a strong push and achieve a long jump (Sajoto, 1988).

b. Power explode muscle

Muscle explosive power is the ability of a muscle or group of muscles to overcoming prisoners burden with strength And speed tall in something movement intact (Suharno, 1986). Power explode or *explosive power* is the ability of a person's muscle or group of muscles to exert force maximum effort exerted in the shortest or shortest possible time (Sajoto, 1988).

Muscle explosive power is a combination of explosive power; muscle strength maximum Which released with maximum speed (Utari, 2007).

The basis for the formation of explosive power *is* strength. Strength as power Which deployed group muscle on business single Which maximum (Russell, 2002).

Radcliffe and Farentinos (1985), States that Explosion power is The main factor in the implementation of all kinds of movement skills and various Sports. Based on the definitions above, it can be concluded that two important elements that determine quality Explosion power is power and speed.

One way to measure explosive power / *muscle power* is based on *Asian Committee on Standardization of Physical Fitness Test* (ACSPFT) for students and cadets who have been modified by the Center for Physical Fitness and Recreation (1977), namely by long jump without starting. One of the matric ability tests In general, according to Barrow, the test for muscle explosive power is: jump Far without prefix (Kirkendall, 1980; quoted Downixs, 2009).

muscle strength is one of the elements that forms explosive power leg muscles. In increasing strength to produce a jump well, necessary The quality of the leg muscles is also good. To get a strong push and high speed, an athlete must have power that explosion big. So Power explode muscle limbs as driving force leapwhile doing it rejection on the board after do the prefix for Gain vertical speed so you can increase your jump distance done (Russell, 1933, quoted Sujiono, 2008).

c. Type sex

At the end of puberty boys have more muscle size large compared to the type of female sex. In addition to children men, the muscles which owned by him especially on the muscles movement at section legs have a better level of development compared to the muscles that girls have . Therefore with strength exercises given intensively will provide benefits for boys in particular on achievement performance through activities sports (Juwariyah, 2005).

Mc Ardle *et al* (1991) stated that in a review of seven research comparing the magnitude of isometric strength in men and women, absolute strength of the upper extremities measured in 11 positions different on Woman, the result is 56% more A little from man. Meanwhile, in

the lower extremities, women only have isometric strength 72% from strength maximum on man.

d. Age

By biological, period teenager is sign end period child And resulting in growth in weight and height, changes in proportion and shape body, And achievement maturity sexual. Period teenager is period a dramatic change in a person. Growth in adolescence there is enhancement on size bone And mass muscle (Hurlock, 2000).

e. Index Mass Body (BMI)

Determining *overweight* and obesity is generally done using a formula *Body Mass Index* (BMI) or Index Mass Body (BMI). BMI is The relationship between height and weight obtained by dividing weight (in kilograms) by height (in meters squared).

B. Latihan Isometric *Quadriceps of the thigh give triceps suras*

1. Definitions Latihan Isometric

Exercise comes from the word train which means: learning to get used to it capable do something, whereas exercise means results from train (Poerwodarminta, 1984, in Juwariyah, 2005). Exercise is a thing process systematic of practice or Work Which done repeated in a way continuous by increasing the amount of load, to achieve training goals (Harsono 1982, in Juwariyah, 2005).

"Isometrik exercise is a from of resistance training in which the participant uses the muscles of the body to exert a force either against an immovable object or to hold the muscle in a fixed position for a set duration of the time" (Stasiewicz, 2009).

The definition of isometric exercise is one of the strengthening exercises in where a person uses the muscles of the body to resist a resistance, and also against an immovable object or maintaining muscles in position Which still, during One set duration time.

Exercise isometric is called Also with exercise static, in where No happen change long muscle And No There is movement Which happen on joints (Phil, 2008). Isometric exercises can be applied in several exercises for increase effectiveness. Component Which most important from exercise isometric is control Respiratory (Phil, 2008).

METHOD STUDY

Type study this is study quantitative with use " *one group pre and post test design with control group* " design , to find out The effect of isometric exercises on the *quadriceps femoris* and *triceps surae muscles* on jumping ability away without a prefix. The subjects of this

research are divided into two groups, namely: one group was given isometric exercises for *quadriceps femoris* muscle using the *isometric squat method* and for the *triceps surae muscle* with the *isometric calf raises method*. For other groups, nothing is given treatment whatever.

Data

Collection data done with do explanation on subject study, give informed consent to candidate respondent, give information about Meaning And objective study, request agreement respondents with sign hand. Then subject shared become two group that is One group Which given exercise isometric For muscle *quadriceps femoris* using the *isometric squat method* and for the *triceps surae muscle* using the *isometric calf method raises*. Stage next is taking data beginning, that is ability jump long distances without starting before getting isometric exercises. Taking Initial data will be carried out at the MAN I Surakarta long jump field. Starting position The subject is standing on a support beam which is 1 meter from the sandbox. Then subject start get ready do jump Far with position beginning of the body A little bow And knee flexion not enough from 45° And position second arms behind body. Moment jump subject must refuse his feet as strong maybe and second arms swing forward to try cover the distance leap as far as possible. Moment land use second foot as fulcrum and then measured the distance of the jump from the fulcrum beam to focus foot Which nearest with beam moment First time land (Dwikusworo, 2000). Next, *isometric squats* and *isometric* exercises are performed *calf raises* in group one are routinely carried out by class XI students MAN I Surakarta trained 12 times, 3 times a week for 4 weeks. *Pre-test* data was taken at the second meeting after giving *the information consent*, namely on March 16 2014. Then for *post test data* too Already taken a day after intervention final that is after 12 time exercise on _ 12 April 2014.

DISCUSSION

Long jump without a start is an activity to make a jump as far as possible without trying to run. In the long jump without a start, the stages The stages or phases that occur are: starting/resting, floating, and landing (Muller *et al*, 2000). The main components of the long jump without starting are: (1) strength muscle, (2) Power explode muscle, (3) type sex, (4) age, And (5) BMI.

Henessy, who quoted by Kerin (2007) state that on moment jump muscle fibers who plays a role big is fiber type 2 or *fast-twitch fibre*. Meanwhile, Smith *et al* (1995) stated that *m. quadriceps femoris* and *m. The gastrocnemius* is dominant in *fast-twitch fibers* so it is suitable for muscle contraction which is strong but short and plays more on the activities that

require speed reaction like run And jump.

Research conducted by Hakkinen (1985) provided strengthening exercises to two group For see effect practice on strength and change areas fiber muscle, show that fiber muscle type 2 (*fast-twitch fiber*) experience enhancement areas *cross-sectional* Which more fast than type 1 fiber (*slow-twitch fiber*). This indicates that the muscle fibers are type 2 This can respond more fast to exercise strengthening Which given.

According to research by Akinori Nagano (2005), when jumping the muscles most widely work is muscle *rectus femoris* , *gastrocnemius* muscle and muscles *soleus*.

Study Which done This Also aim For increase ability jump Far without prefix with method practice muscle *quadriceps femoris* and *triceps surae*. These two muscle groups are dominant in *fast-twitch fibers* (type 2) where type 2 muscle fibers can respond to training more quickly and plays a big role and works the most when jumping. This is what causing this research to show results in increasing long jump ability without prefix.

A number of literature States that physical training can cause adaptation on brain And medulla spinalis And ability somebody For increasing motor unit recruitment with practice. Neural factors that involve muscle strength are the activation of motor units (frequency and number) which consist of *slow-twitch muscle fibers* and *fast-twitch muscle fiber* , involvement of pathways sensory and motor, and motor unit synchronization (Lamb, 1984, in Broughton, 2001).

Besides factor neural, factor other Which need considered is enhancement areas *cross sectional* or broad cross-sectional area muscle. Enhancement *cross-sectional* area has a strong relationship with muscle strength (Lamb, 1984, in Broughton, 2001).

Komi (1986) in Broughton (2001) States that enhancement alpha activation motor neurons with motor neuron synchronization is possible happen hypertrophy muscle.

Zatsiorsky (2006) states that the concept of an exercise is based on the idea that the manifestation of power is determined by two factors namely muscles- peripheral muscles (in the form of muscle hypertrophy) and central coordination. This too in accordance with statement Broughton (2001) about enhancement strength muscle is combination between Activation neural And hypertrophy muscle.

Two types of muscle fiber hypertrophy can be distinguished schematically, namely: (1) *sarcoplasmic hypertrophy* And (2) *myofibrils hypertrophy*. On *sarcoplasmic hypertrophy*, area density filament in fiber muscle the decrease temporary wide cross section fiber muscle (*area cross-sectional*) increase without there is an increase in muscle strength. Meanwhile, *myofibril hypertrophy* is defined as enlargement from size fiber muscle with increasing amount *myofibrils*

And on moment Which The same, amount actin And myosin Also increase. Besides Therefore, contractile proteins will be synthesized and increase the density of the filaments. Type hypertrophy of this type of muscle fibers (*myofibril hypertrophy*) causes production muscle strength increases. The capacity of the resulting muscle strength depends on the *cross-sectional area* or cross-sectional area of the muscle area and partly on the number fiber muscle (Zatsiorsky, 2006).

Isometric exercise is a strengthening exercise in which a person uses the muscles of the body to resist a prisoner, and also fights an object not move or maintain the muscles in the correct position still, during One set duration time (Stasiewicz, 2009).

Exercise isometric is called Also with exercise static, in where No happen change long muscle And No There is movement Which happen on joints (Phil, 2008). Thibaudeau (2005) stated that some examples from exercise isometric that is maintain burden in position certain on something scopemotion joints And interesting or push oppose burden / prisoner external Which not move. Almost all over motorcycle units can recruited during contraction maximal isometric .

Isometric exercises are effective in causing hypertrophy of muscle fibers, increasing connection *cross-sectional* , increase Activation neural, And increase synchronization motorcycle units (McArdle, 1991).

On study experiment This give exercise isometric For improve the ability to jump long distances without starting. As for discussion of the results study the can expelled in lower This

Isometric exercises on the *quadriceps femoris* and *triceps surae muscles* with *isometric squat* and *isometric calf raises* methods can improve ability jump far without starting. This can be seen from the different *pre-test* and *post- tests test* on group I using test t pair (*paired samples t-test*) obtained mark Which significant that is $p = 0,000$ ($p < 0.05$).

isometric strengthening exercises on the *quadriceps femoris muscle* using the *isometric squat method* and on the *triceps surae* with the *isometric calf raises method* so that it can increase strength and power or explosive power of the muscles. This is because hypertrophy of the fibers occurs muscle, enhancement connection *cross-sectional* , enhancement Activation neural, And enhancement synchronization motorcycle units. Whereas factor Which influence the ability to jump long without a start is muscle strength, muscle explosive power, type gender, age, and BMI. So that muscle strength and muscle explosive power increases so ability jump Far without prefix Also can increase.

Exercise isometric very Specific For muscle certain, so that To increase muscle strength with isometric exercises it must be on the muscles that will aimed And on a number

of scope motion joints certain (McArdle, 1991).

Thibaudeau (2005) Also state that exercise isometric can Increase muscle strength in the range of motion of the joint being trained. Exercise isometrics will be more effective if the muscles contracted maximum, with contraction time 1-10 seconds, and in 3 positions for each movement. All three positions These include: (1) a few inches from the starting position, (2) the core position, and (3) a few inch from position end.

Kelley (1977) stated that muscle contractions should be maintained for no less than 6 or 9 seconds, and ideally it is best to do isometric exercises in 3 positions in each exercise. Apart from that, based on research, isometric exercises should be done 3-5 times a week with training periods during 6 until 8 Sunday, can show results Which Good.

In this study, the isometric exercises carried out were also specific, namely on the *quadriceps femoris* and *triceps surae muscles* and used 3 positions. within the range of motion of the joint. In the isometric squat exercise , the positions are: (1) knee flexion 45° , close to the starting position, (2) knee flexion 60° , where in this position is the maximum isometric strength in the quadriceps femoris (Smith, 1990), and (3) knee flexion 90° , approaching the final position. Meanwhile, for *isometric exercises calf raises* position is : (1) plantar flexion maximum, approach position end, (2) plantar flexion 25° , core position when jumping, and (3) dorsi position flexion, approach position beginning.

CONCLUSION AND SUGGESTION

The research entitled "The Effect of Isometric Exercise Muscle *Quadriceps Femoris* and *Triceps Surae* on the Ability to Jump Long Without a Start In Class XI MAN I Surakarta Students" was carried out on 64 divided subjects become two group, group I given exercise isometric on muscle *quadriceps femoris* And *triceps surae* whereas group II is groupcontrol Which No given treatment.

Isometric exercises with method *isometric squats in the quadriceps muscle femoris* and *isometric calf raises* on the *triceps surae muscle* are done as many times as 3 times a week for 4 weeks carried out in the MAN I school environment Surakarta can improve the ability to jump long distances without starting. This matter can be proven from the results of statistical analysis which shows an increase mean (*mean*) long jump ability without a start from 205.50 ± 22.854 to $230.94 \pm 21,034$.

B. Suggestion

Exercises using the *isometric squat method* on the *quadriceps femoris* and muscles *Isometric calf raises* on the *triceps surae muscle* is a form of exercise that has proven Can increase ability jump Far without prefix.

Study furthermore expected For use group comparison with given treatment so that can know comparison effectiveness from exercise the.

Further research is also recommended to use subjects with types sex women so can known differences between results study on subject man and women. Recommended too For control or suppress subject activities outside the study that could influence the results study, so that researcher Can know effectiveness from exercise the isometric .

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