Multi-articular Muscle

Characters Assessment Treatment

CONTENTS

No.1 Definition and Characters

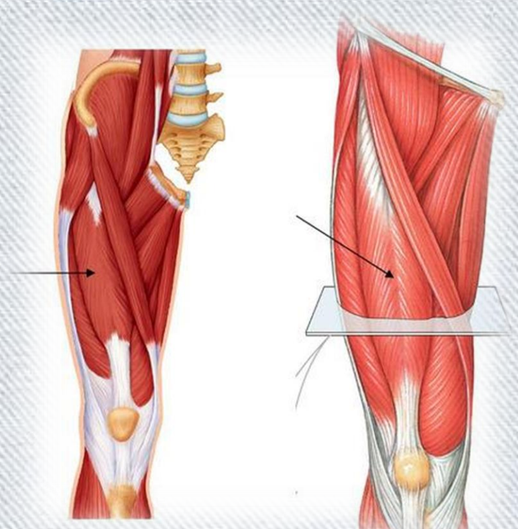
No.2 Accessment and Classification

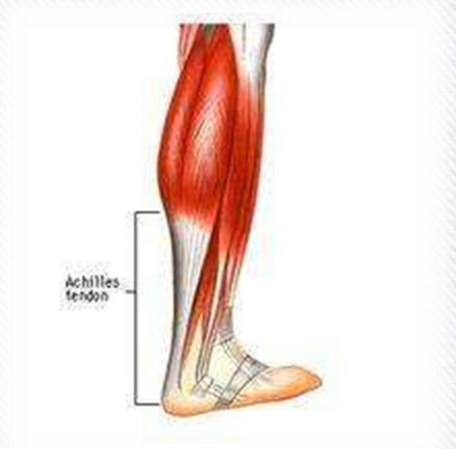
No.3 Therapeutic Exercise

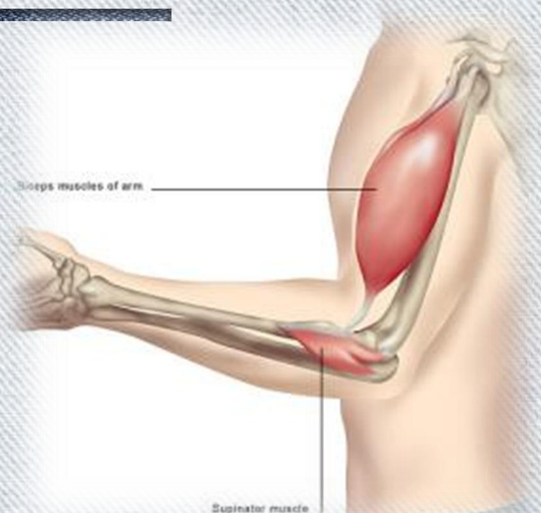
PART 1 Definition and Characters

Bi-articular muscles :

Generally cross two joints and influence movement at both.

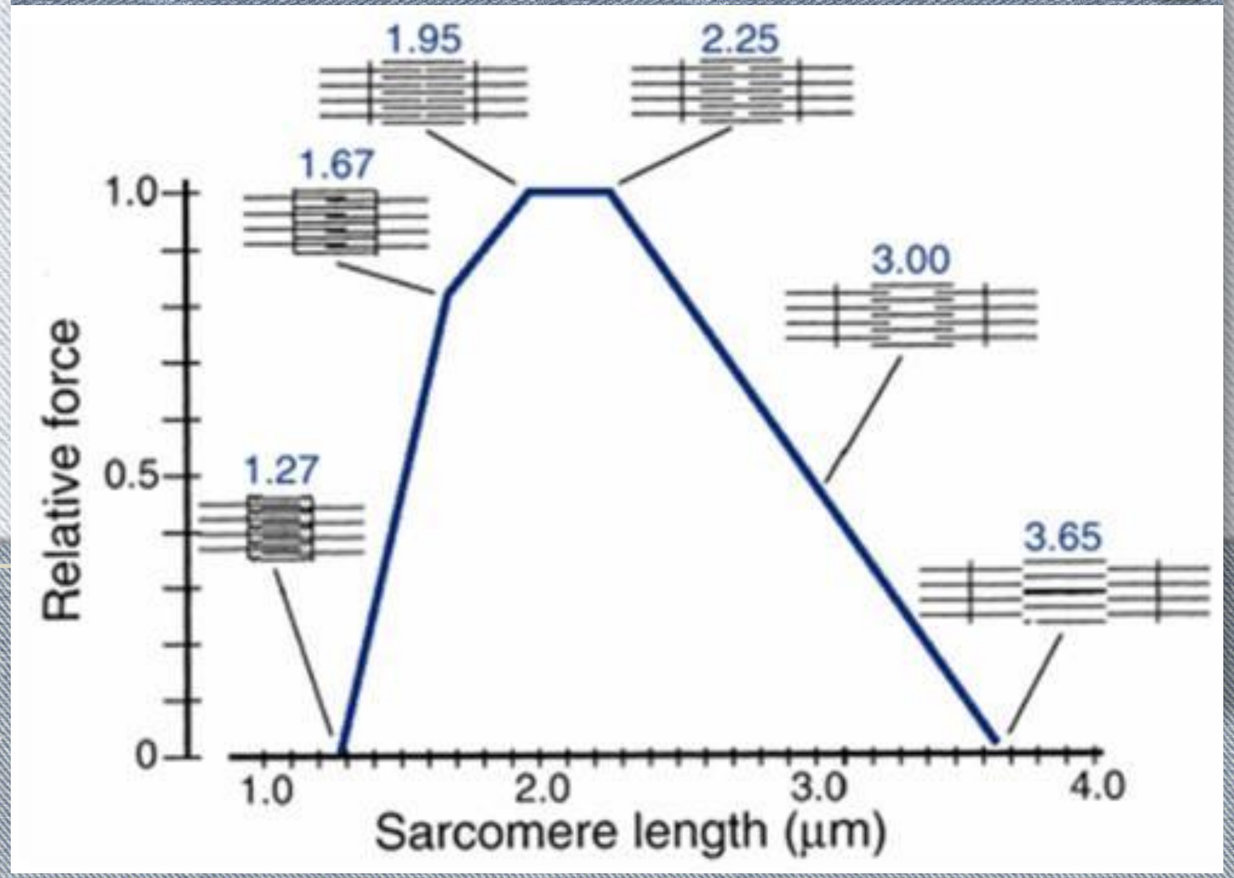






Reference:Actions of Two Bi-Articular Muscles of the Lower Extremity.Landin D, Thompson M,J Clin Med Res. 2016 Jul;8(7):489-94

Active Inficiency



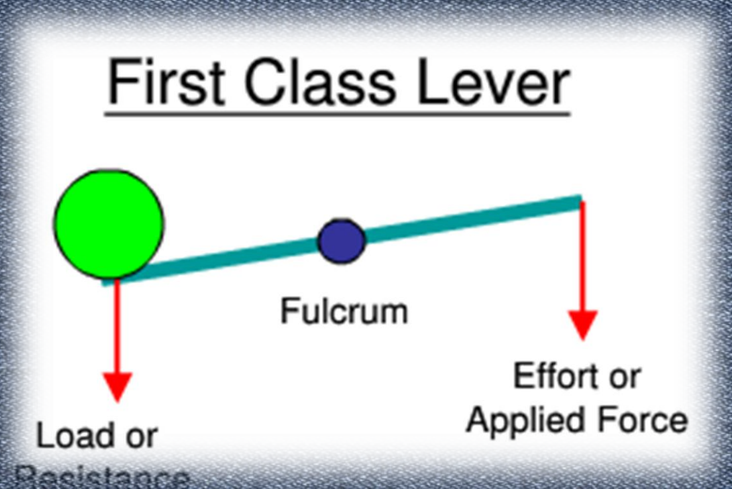
- Length-tension curve :Tension is directly proportional to the.
- The actin-myosin filaments slide together and sarcomere become shorte
- Gastrocnemius:With knee extended and flexed.

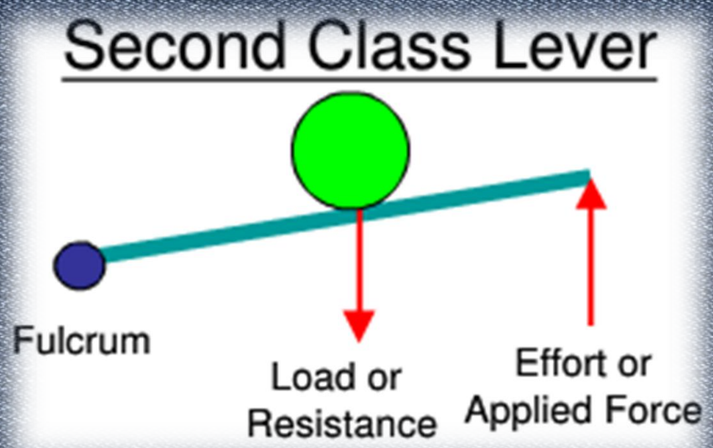
Reference:The impact of altered task mechanics on timing and duration of eccentric bi-articular muscle contractions during cycling.Connick MJ, Li FX.J Electromyogr Kinesiol. 2013 Feb;23(1):223-9.

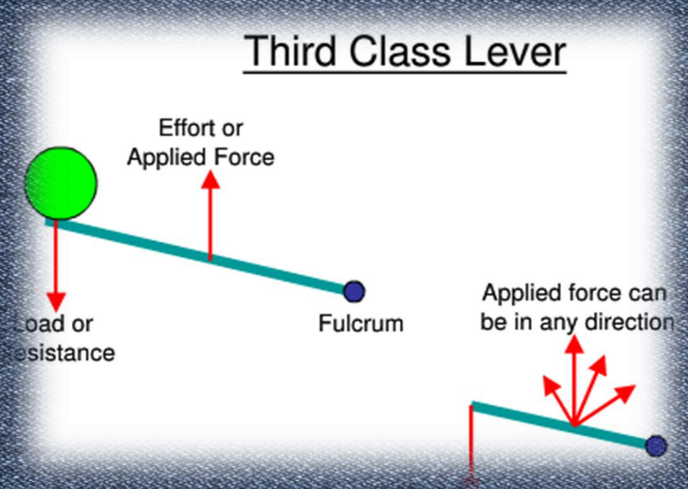
Passive Inficiency

- The stretching at another joint will be more difficult.
- Be important for prevention of sports injury.
- Especially in large range of motion.

Reference:Passive Muscle-Tendon Unit Gearing Is Joint Dependent in Human Medial Gastrocnemius.Hodson-Tole EF, Wakeling JM, Dick TJ.Front Physiol. 2016 Mar 15;7:95.







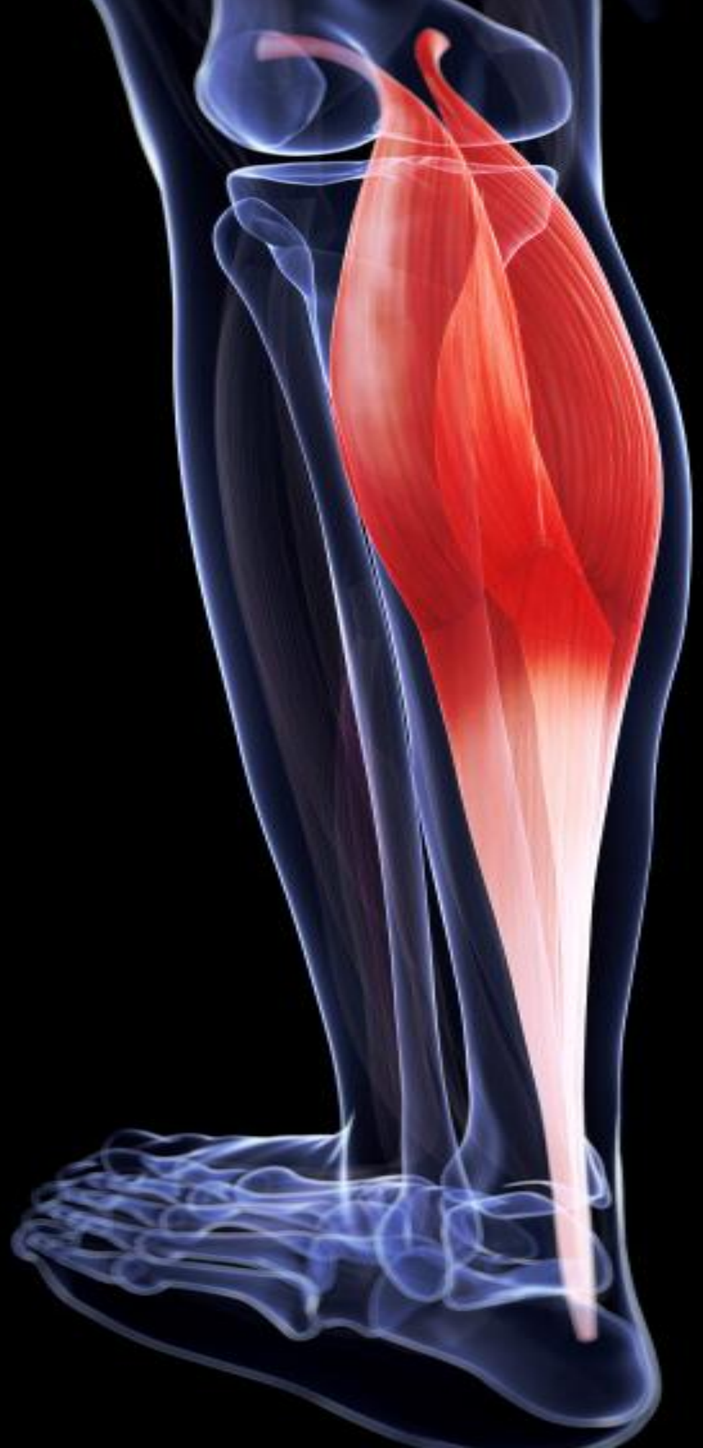
First-class Lever Second-class Lever Third-class Lever

Reference:Actions of Two Bi-Articular Muscles of the Lower Extremity.Landin D, Thompson M,J Clin Med Res. 2016 Jul;8(7):489-94

Unique Role in Complexed Movements

Transfom the rotation in the ankel and knee joint into the translation of the body centre of gravity in such a way that the centre of gravity is continuously accelerated .

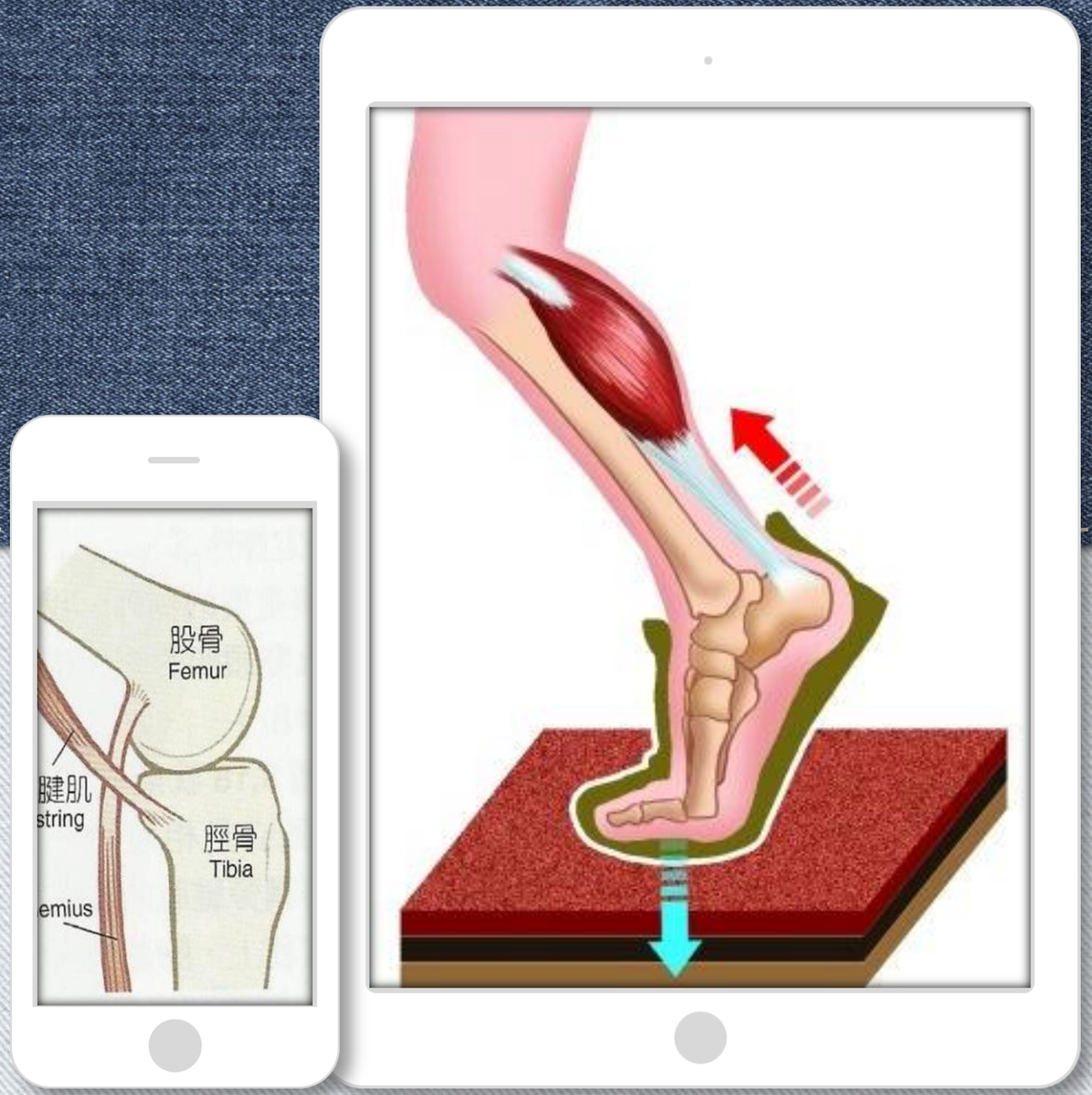
Reference:Changes in muscle and joint coordination in learning to direct forces.Hasson CJ,.Hum Mov Sci. 2008 Aug;27(4):590-609.



02
Evaluation

Gastrocnemius

Function



- Knee: flexion
- Ankle: plantar flexion

POSITION 03 **Prone position**

CONDITION 02 **unable to stand**

METHOD 01 **MMT**

Non-weight position

差+ 可以移動的角度不到最大活動度的一半。

可- 可以移動的角度大於最大活動度的一半。

可 可以移動的角度等於最大活動度。

可+ 不能承受最大的阻力。

好 可以承受最大的阻力。

《肌肉骨骼评估基础与技术》

M.Lynn Palmer,PhD,PT

Calf Raise

RESULT

Weight position

差+：可以移動的角度不到最大活動度的一半。

可-：可以移動的角度大於最大活動度的一半。

可：可以做一次來回。

可+：可以做二到三次來回。

好：可以做四到六次來回。

好+：可以做七到八次來回。

正常：可以做到十次來回。

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CAUTION

Point 1

soleus

Point2

toe flexor

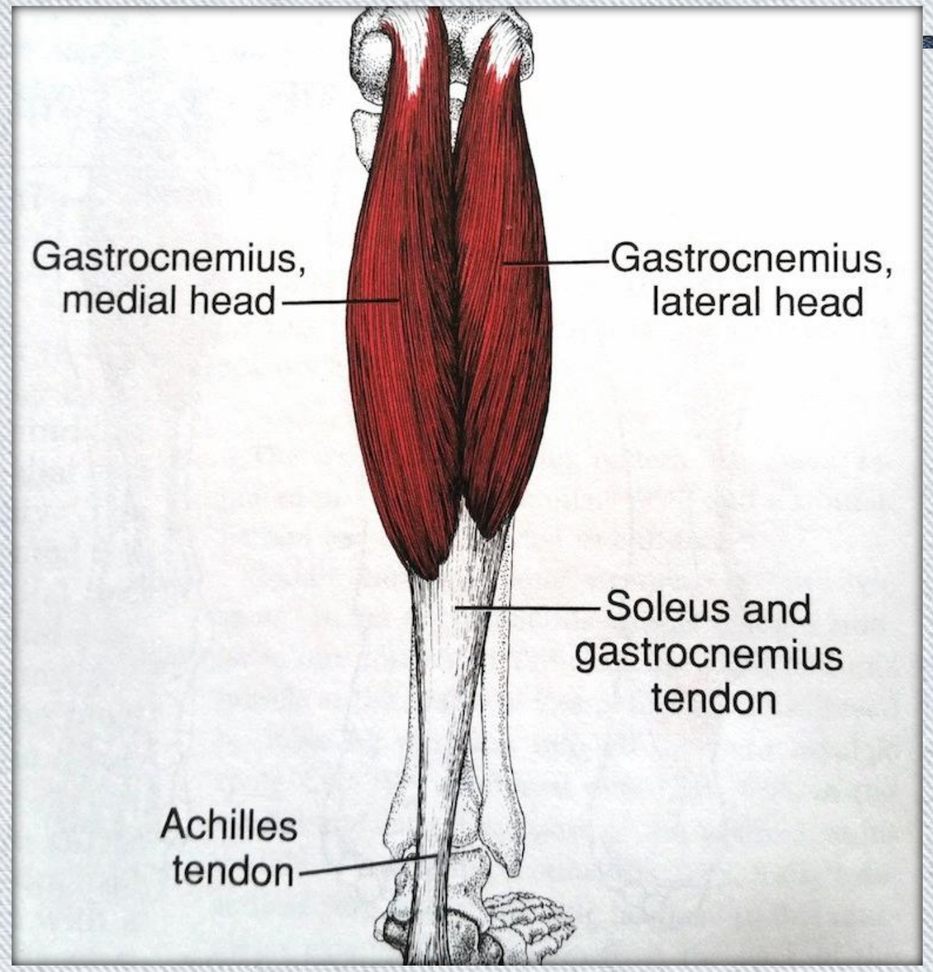
Point3

tibialis posterior

peroneus

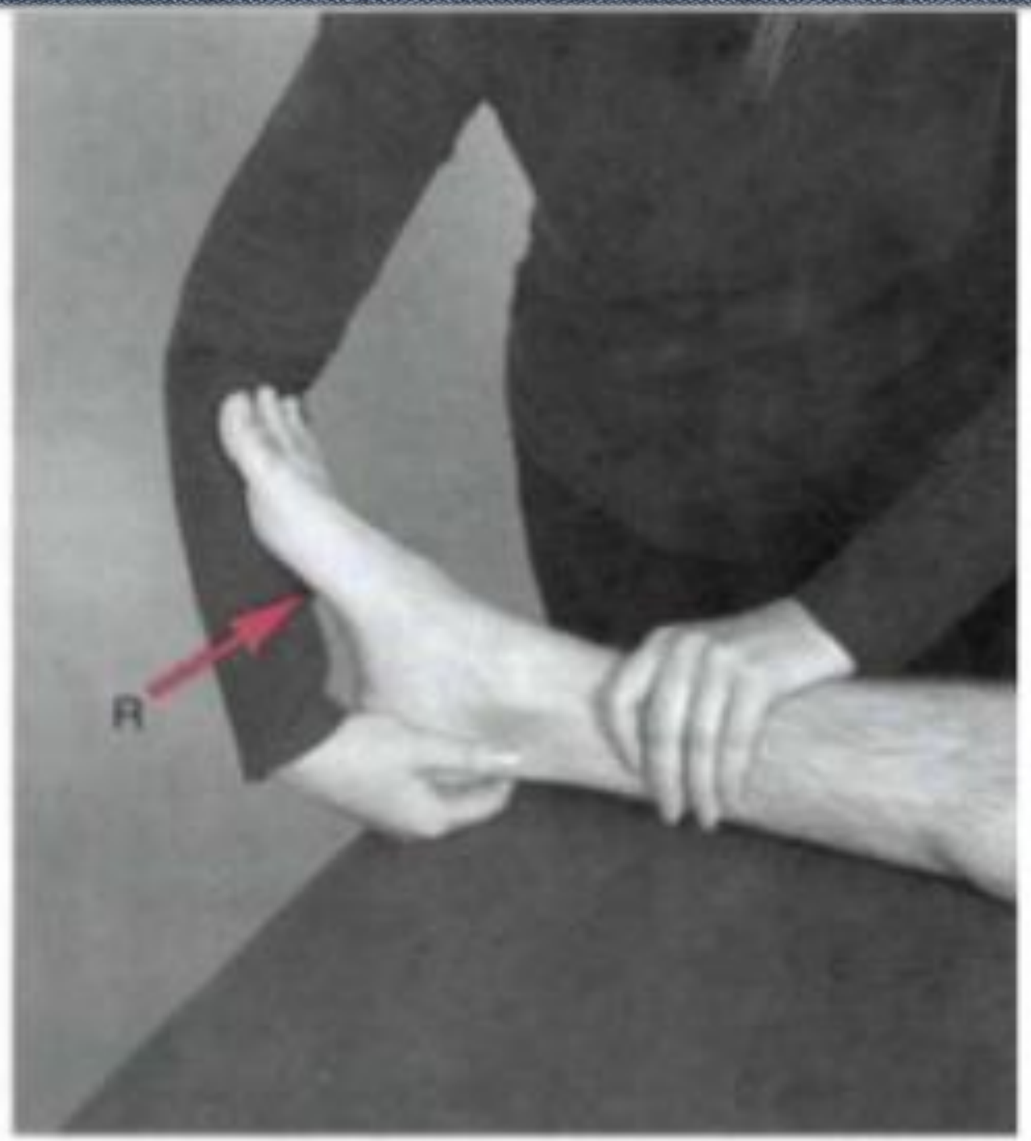
TREATMENT

- MANUAL RESISTANCE
- CALF RAISES
- STRETCHING



The effect of gastrocnemius muscle on ankle joint is greater than the counterpart on knees.

Focus on the strength training of ankle joint.



B

URE 6.32 *(A)* Resisted dorsiflexion. (B) Resisted plantarflexion of the
le.

Resist plantarflexion

Hand Placement and Procedure

- Apply resistance to the medial aspect of the first metatarsal to resist inversion and to the lateral aspect of the fifth metatarsal to resist eversion.
- Stabilize the lower leg.

Self-Resistance Exercise

CALF RAISE EXERCISE

CALF RAISE EXERCISE

10times/group
2groups/day

1

2

20times/group
3groups/day

Increase the weight ,
e.g. use sandbags

3

4

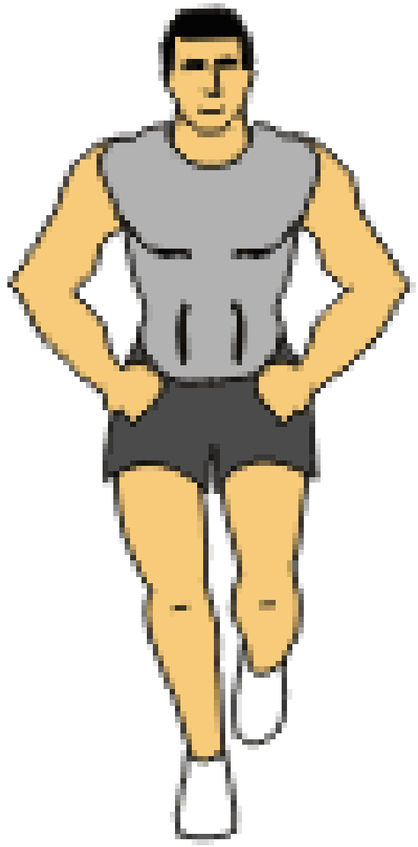
Change into
single leg

PRECAUTIONS

- The key point is to maintain the extension of the knees, only when the knees fully extend can the gastocnemius have the greatest effect on ankle, or it will contract soleus .
- Training the gastrocnemius in closed-chain is to increase the coordination and proprioceptive input of lower extremity .

Come back to daily life

- Coordination of the joints and muscles
- Jumping, especially the moment of pushing off
- Two legs → Single leg



STRECHING

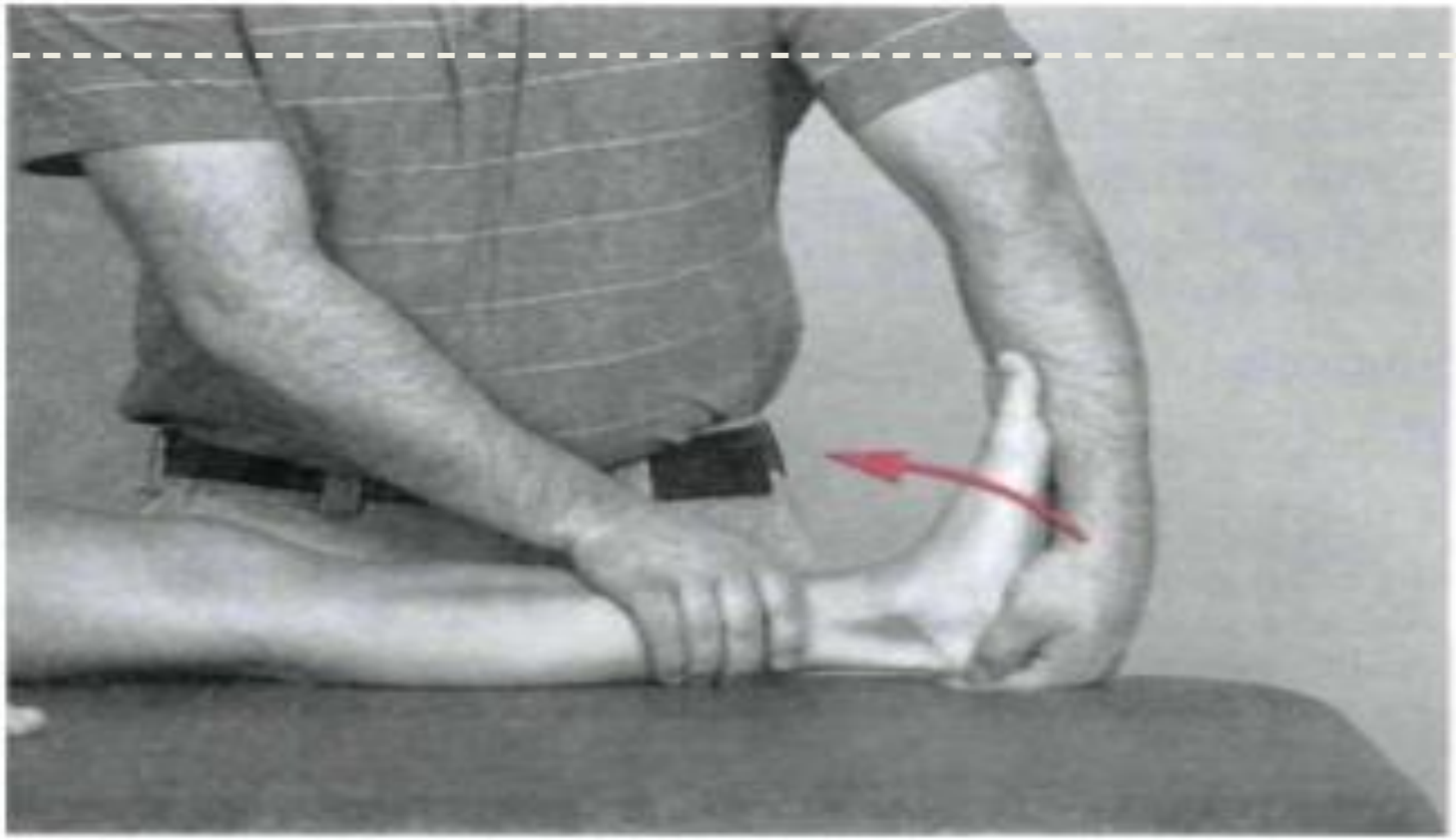


FIGURE 4.34 Hand placement and procedure to increase dorsiflexion of the ankle with the knee extended (stretching the gastrocnemius).

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THANK YOU FOR WATCHING!

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