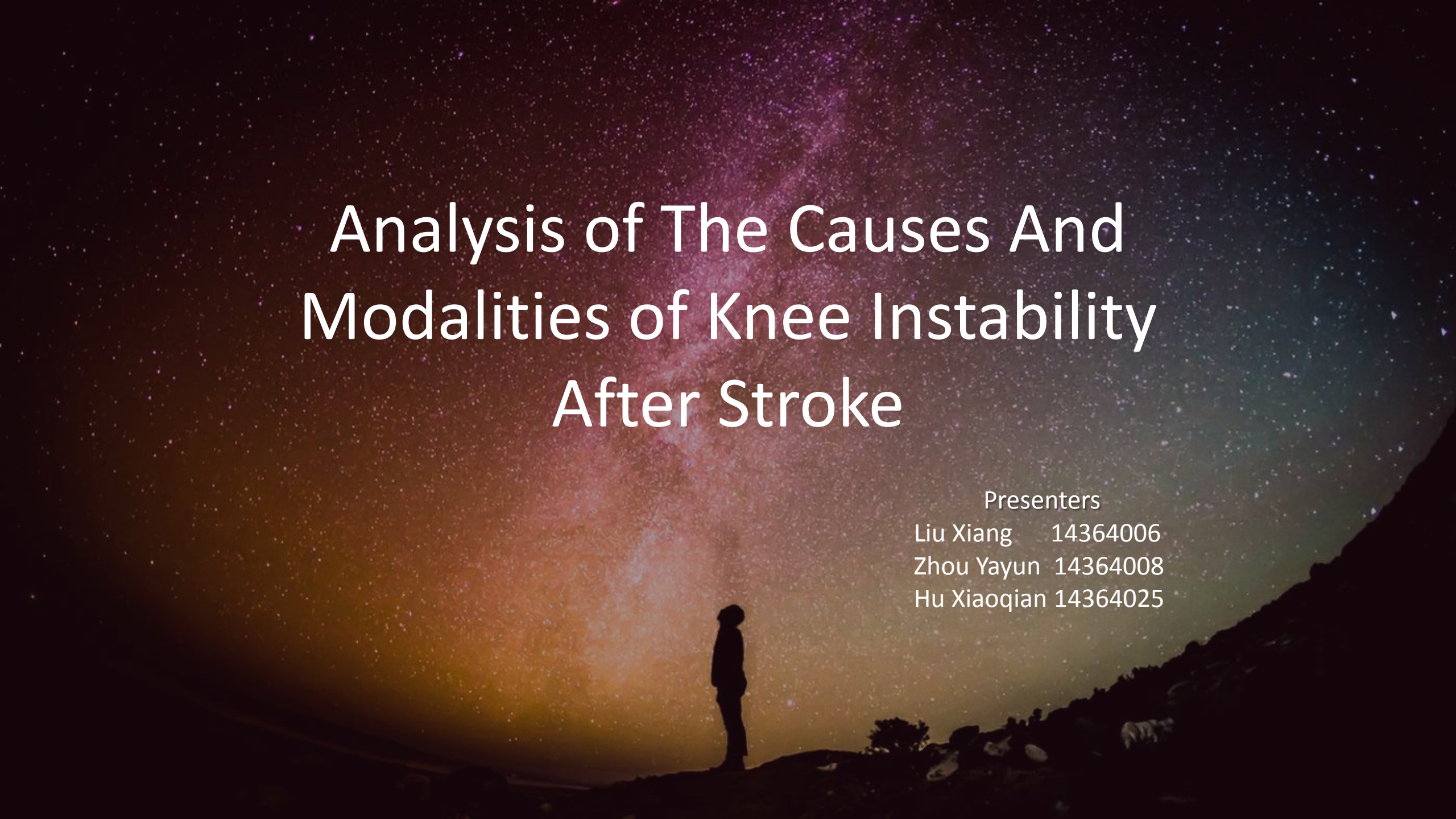


Analysis of The Causes And Modalities of Knee Instability After Stroke

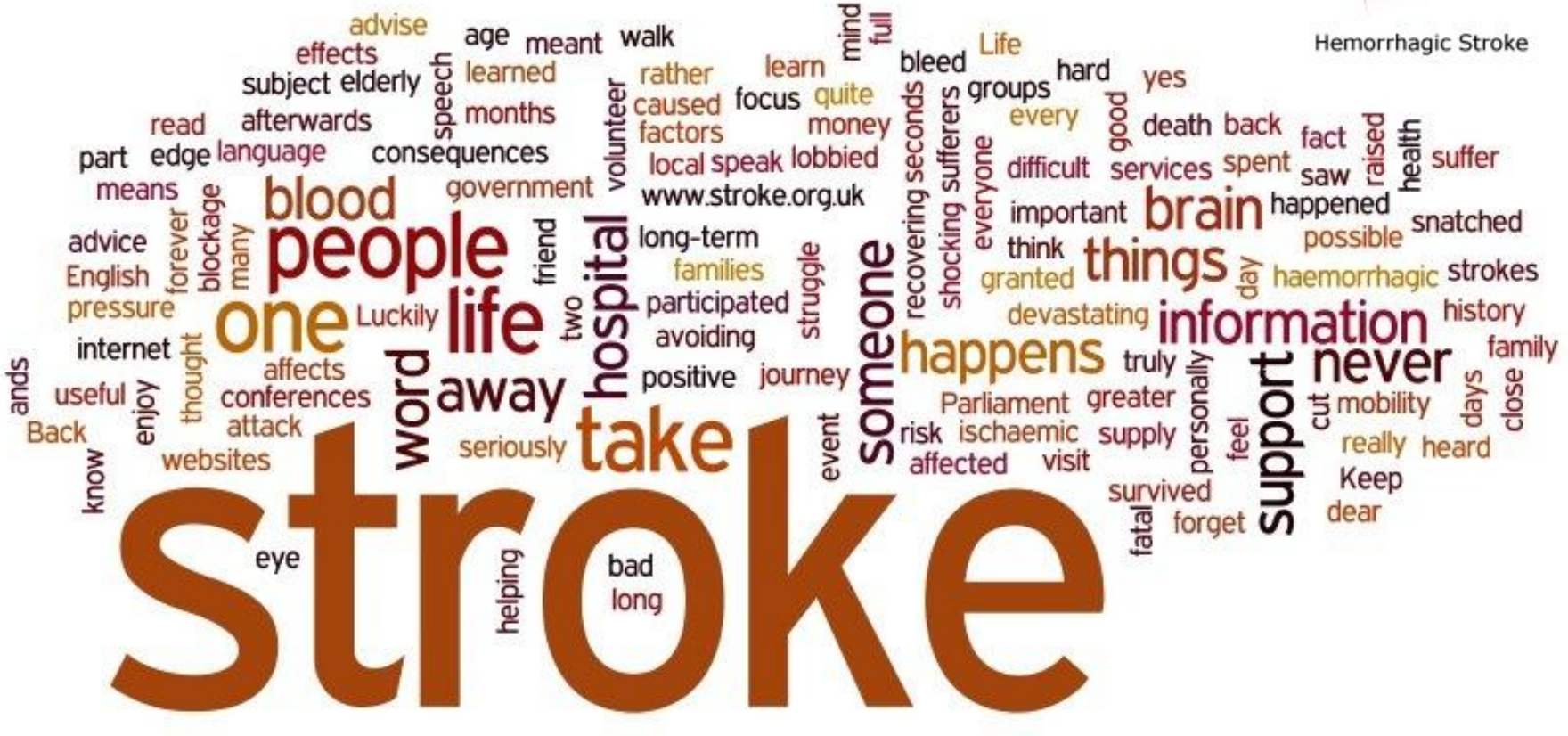
Presenters

Liu Xiang 14364006

Zhou Yayun 14364008

Hu Xiaoqian 14364025

CONTENTS



The ability to walk

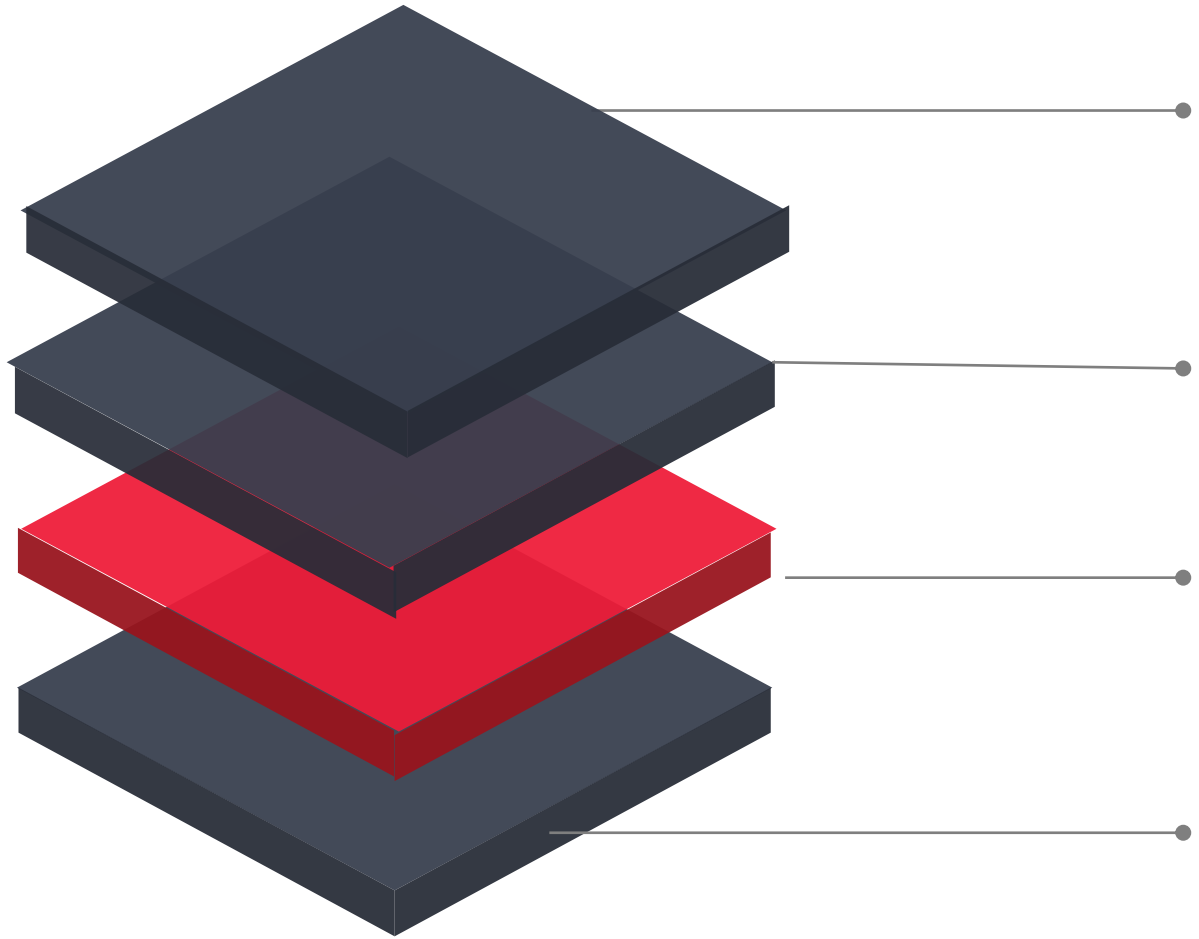
whether a patient will go home
whether he will return to the previous level of productivity

（theramedicrehab.com）

Mechanism

By Hu Xiaoqian

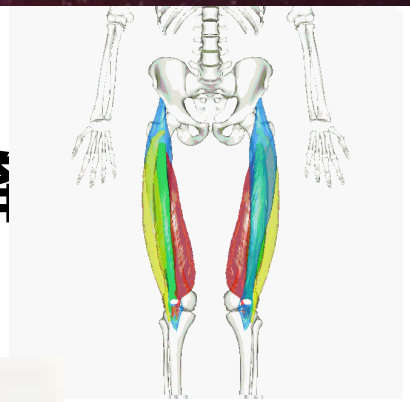
Mechanism

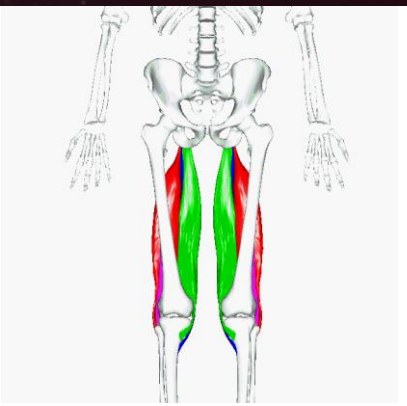


- **Decreased Muscle Strength**
- **Abnormal Muscle Tension**
- **Proprioceptive Disorders**
- **Instability Movement Strategies**

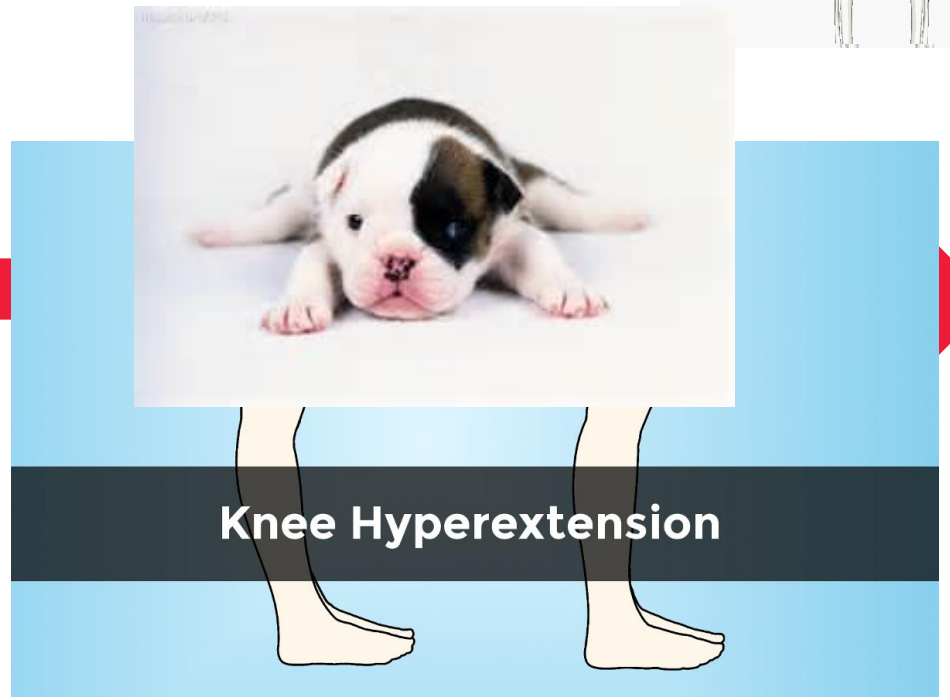
Mechanism

Decreased Muscle Strength 肌力下降





- Neuronal Disturbance
- Limb Immobilization



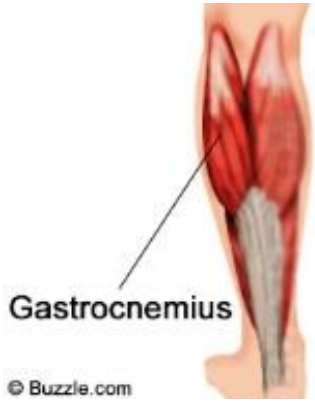
- Insufficient control of flexion and extension in 0°~15°
- Deformity

Cooper, A. (2012). The relationship of lower limb muscle strength and knee joint hyperextension during the stance phase of gait in hemiparetic stroke patients. *Physiotherapy research international : the journal for researchers and clinicians in physical therapy, 17*(3), 150-6.

Mechanism

Abnormal Muscle Ten

Spasm of gastroc quadriceps femoris



ction

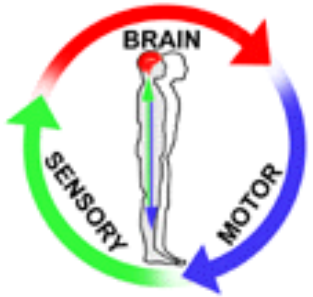
Limit the motion center of gravity

Knee Instability

Thibaut, A (2013). Spasticity after stroke: physiology, assessment and treatment. *Brain Injury, 27*(10), 1093-105.

Mechanism

Proprioceptive Disorders 本体感觉障碍



Damage of CNS

Decreased ability t the information

Dynamic sensation in knee disappears

Cognitive processing delays

P r

Knee Instability

Simo, L., Botzer, L., Ghez, C., & Scheidt, R. A. (2014). A robotic test of proprioception within the hemiparetic arm post-stroke. *Journal of Neuroengineering & Rehabilitation, 11*(1), 1-12.

Mechanism

Instability Movement Strategies 不稳定的动作策略

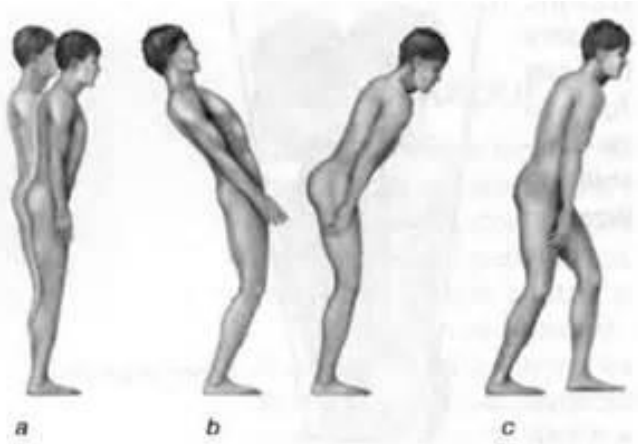


Figure 2.5 Balance strategies: *(a)* ankle, *(b)* hip, and *(c)* step.

l

R

nents Too early training

pensatory walking strategies

he ankle strategy to a lesser extent

ce and Increase energy expenditure

Instability

O'Connor, J. (2016). Orthotic management of instability of the knee related to neuromuscular and central nervous system disorders: systematic review, qualitative study, survey and costing analysis. *Health Technology Assessment, 20*(55), 1-262.

Mechanism

Soldiers with low spirits

Strong Enemy

Inaccurate situation judgments

Defective strategies

Unconscious general

- Decreased Muscle Strength
- Abnormal Muscle Tone
- Proprioceptive Disorders
- Instability Movement Strategies

+ CNS impairments

Failure of the war

Knee Instability


2
PART
Treat Methods

CONTENTS

Section1

Methods towards muscle performance

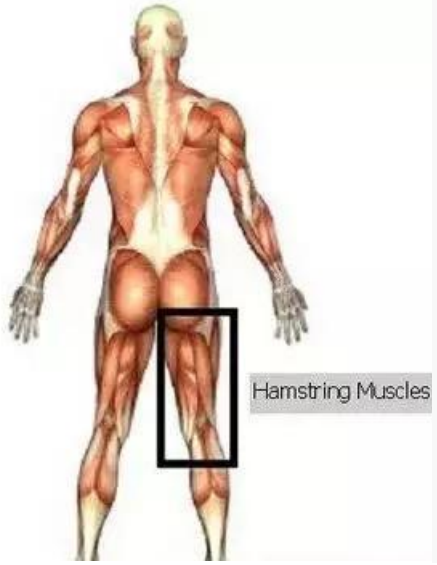
1 Methods towards muscle performance

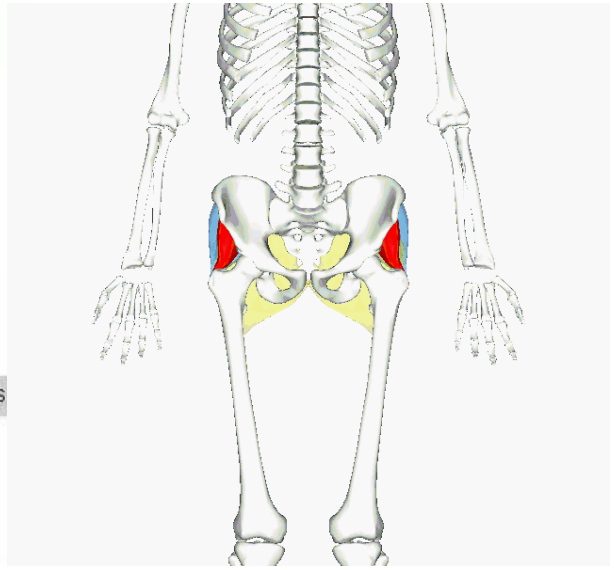
【Weakness muscle】

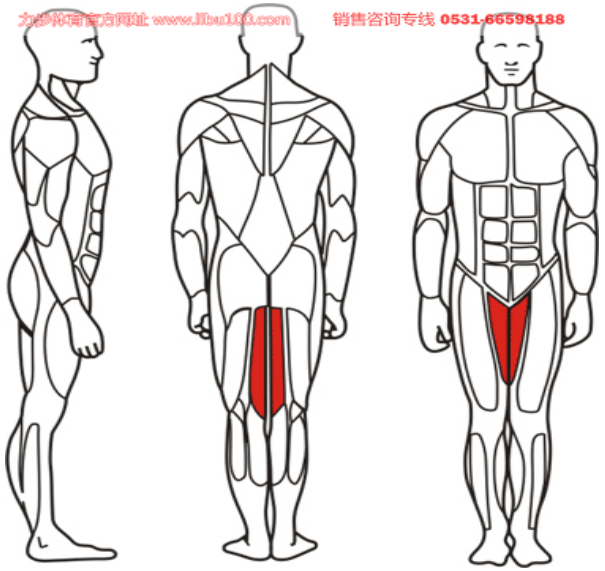
- Quadriceps femoris
- Knee flexors: Hamstring muscles
- Hip extensors: Gluteus maximus
- Vastus medialis oblique(VMO)
- Vastus lateralis oblique(VLO)

【Methods】

- Kinetotherapy
- Physical agencies :Electrotherapy ...







Ohata K, Yasui T, Tsuboyama T, Ichihashi N. Effects of different apparatus used in muscle activity in adults after stroke. Gait Posture 2011;33:102-107.

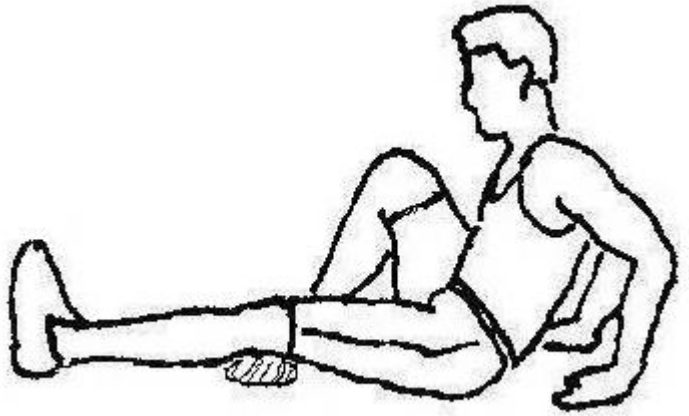
1 Methods towards muscle performance

【Medical apparatus and instruments】

- Own gravity
- Theraband
- Sandbag
- Cybex muscle strength training system
- Limbs linkage (Nustep T4)

Carolyn Kisner,Lynn Allen Collby,Therapeutic Exercise Foundationns and techniques.

1 Methods towards muscle performance

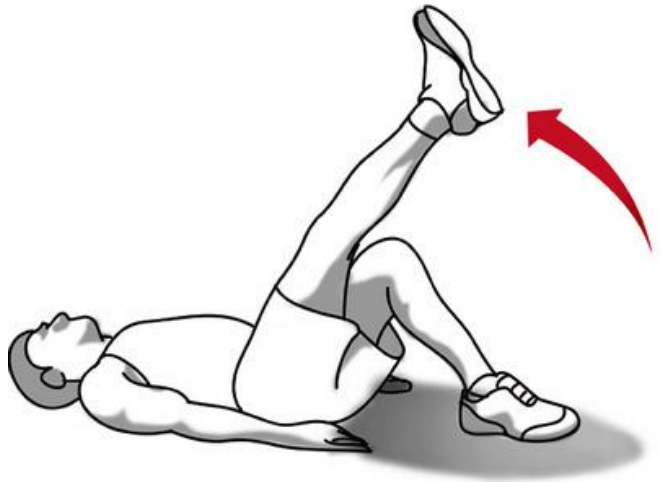


【Treatment contents】

- Muscle strength
- Muscle endurance
- Muscle power(optional)

【Methods】

- Isometric Exercise:Early stage,Limitation in ROM
- Isokinetic Exercise:Safety



【Models】

- Concentric Exercise
- Eccentric Exercise

Appasamy M, De Witt ME, Patel N, Yeh N, Bloom O, Oreste A.Treatment strategies for genu recurvatum in adult patients with hemiparesis: A case series. PM R 2015;7:105-112.
Carolyn Kisner,Lynn Allen Collby,Therapeutic Exercise Foundationns and techniques.

1 Methods towards muscle performance

【Attentions】

- Implement the exercise step by step
- Move forward or backward properly.
- Control the patient’s power : Avoid the spasm of the extensors.
- Remind the patient to focus attention and control the angle of the articular.
- Standard action :Therapist’s posture ,patient’s position , direction of the power
- Communication:Attain the patient’s feedback and adjust the training
- Breathing

Carolyn Kisner,Lynn Allen Collby,Therapeutic Exercise Foundationns and techniques

1 Methods towards muscle performance

➢Vastus medialis oblique

Method 1

【Position】：Lie supine and lateral rotate the affected limb，weight bearing of the anterior tibia

【Action】：Dorsiflex of the ankle.

【Attention】：The knee cant’ leave the bed，immobilize the hip.

Method 2

【Position】：Lie supine and put a towel under the popliteal space,making the knee flex about

10°~15°

【Action】：Extent the knee and hold on ,t hen put it down on the bed.

【Attention】：Finish the motion slowly ,with the patient’s control.

Method 3

【Position】：Standing forward the mirror with lower limbs separating

【Action】：Squat slowly and then stand straight.

【Attention】：Keep the body orthocenter in the middle of the coronal plane.

The patient’s feedback and proper voice prompt.

Embrey DG. et al. Functional electrical stimulation to dorsiflexors and plantarflexors during gait to improve walking in adults with chronic hemiplegia[J]Arc Phy Med Rehabilit. 2010. 91(5): 667—696.

1 Methods towards muscle performance

➢Vastus medialis oblique

Embrey DG. et a1. Functional electrical stimulation to dorsiflexors and plantarflexors during gait to improve walking in adults with chronic hemiplegia[J]Arc Phy Med Rehabilit. 2010. 91(5): 667—696.

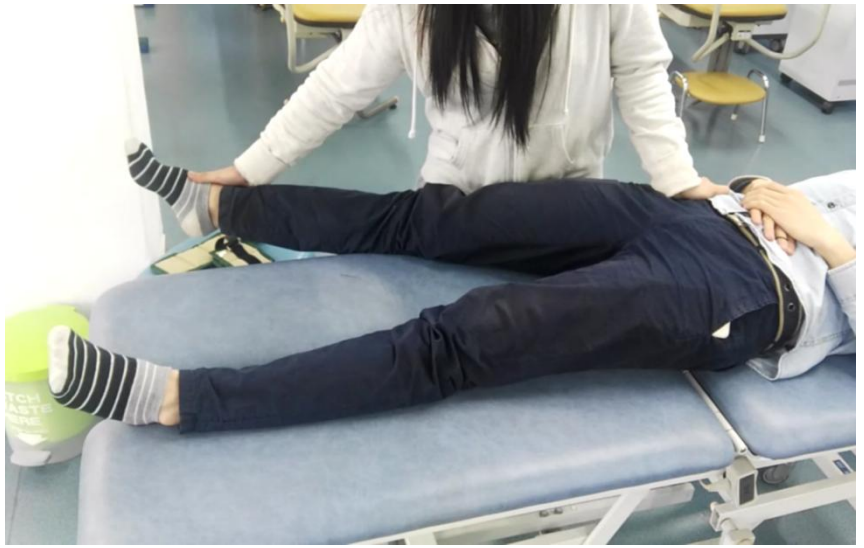
1 Methods towards muscle performance

➢Vastus lateralis oblique

Method 1

【Position】 : Lie supine of the anterior tibia

【Action】: The affected limb abduct.



Method 2

【Position】 : Lie supine and flex both the affected hip and knee in 90°.

【Action】 : Lateral move the knee ,or lateral/medial rotate the crus.

【Attention 】: Control the knee don’t fall down on the bed.

Method 3

【Position】: Stand with lower limbs separating

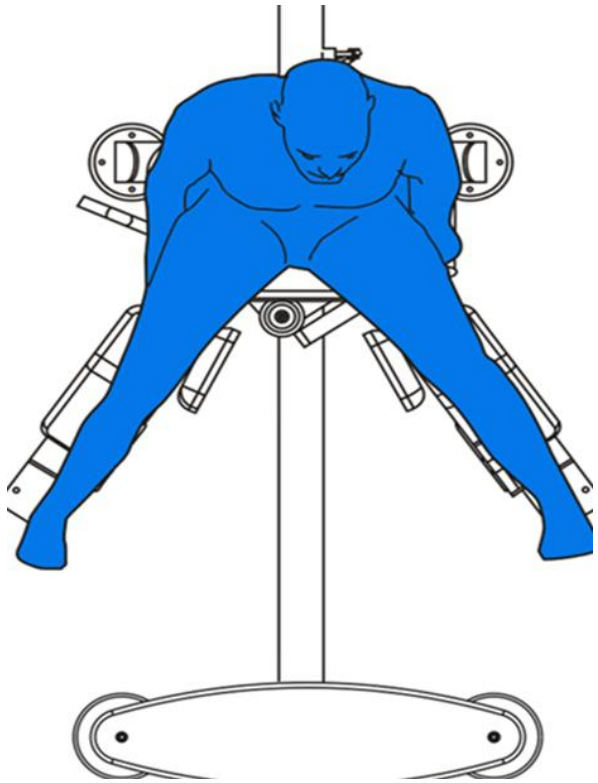
【Action】 : The body move to the different directions (L, R, Forward, Backward)

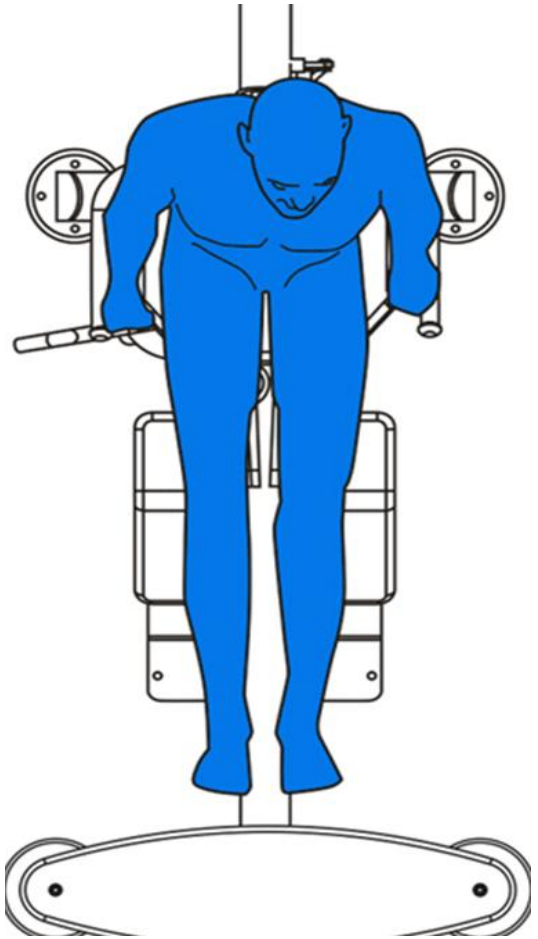
【Attention 】:The feet hold the ground tightly.

闵若谦,马倩.选择性股外侧肌训练改善脑卒中患者膝过伸的疗效观察.(100123)

1 Methods towards muscle performance

- **Vastus medialis oblique and vastus lateralis oblique**
  ——BH Seal Serizes VMO/VLO traing machine

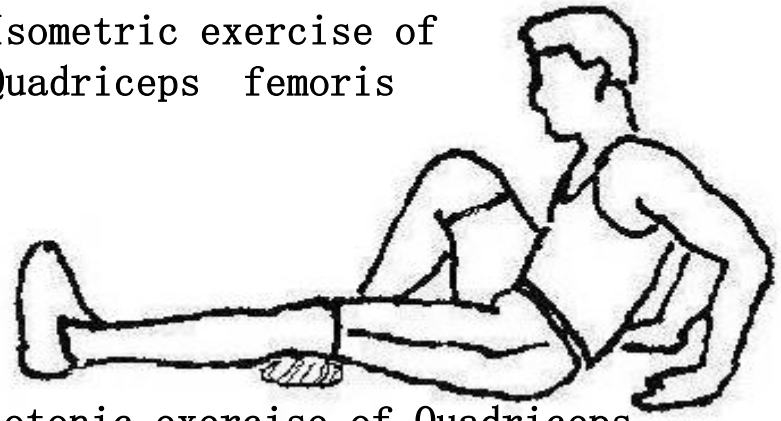




1 Methods towards muscle performance

➢ Quadriceps femoris and Hamstring muscles

Isometric exercise of Quadriceps femoris



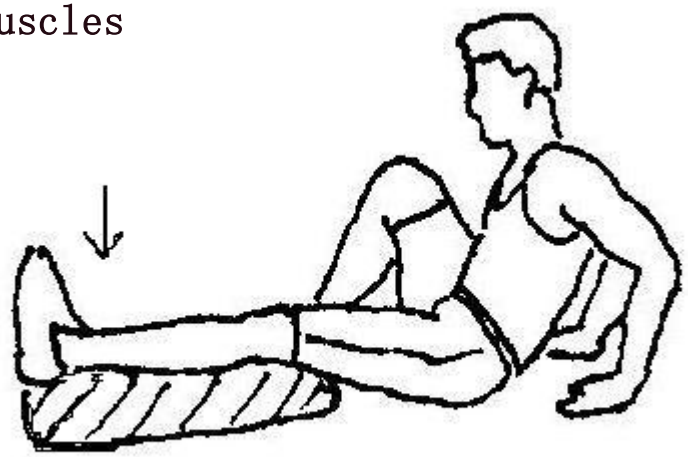
Isotonic exercise of Quadriceps femoris and tibial anterior

Resistence exercise used machine

1 Methods towards muscle performance

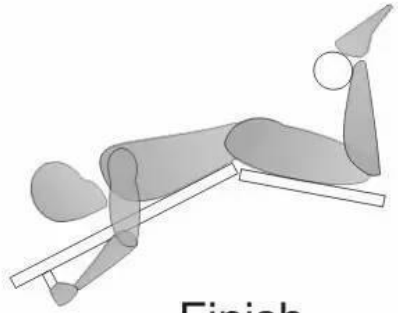
➢Hamstring muscles

Isometric exercise of Hamstring muscles



Bridge exercise add Theraband

Start

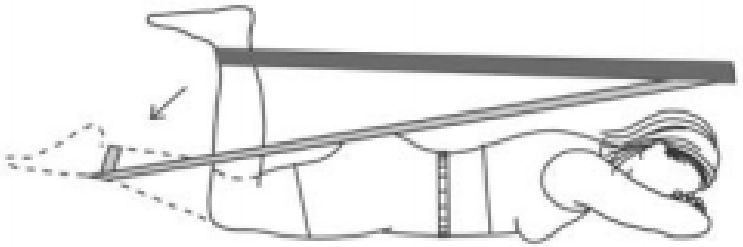


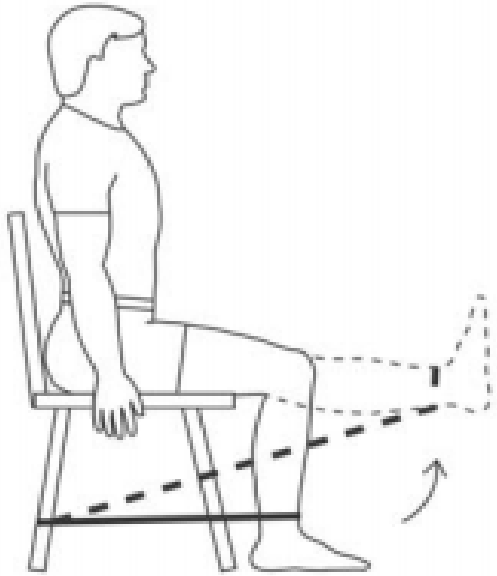
Finish

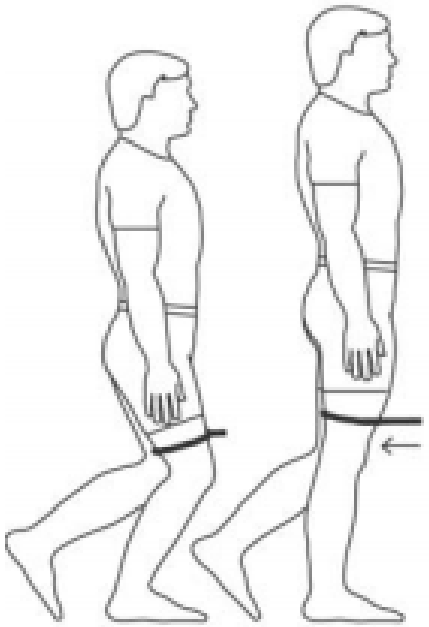
When the patient can bear load and have a basical control of lower limb.

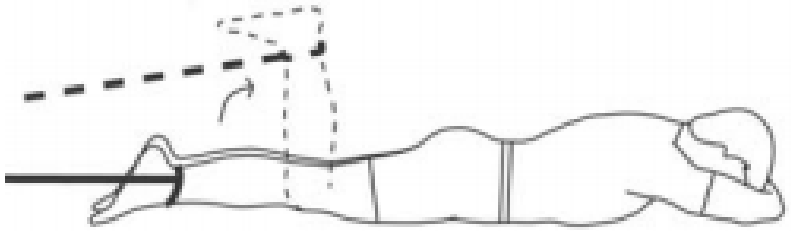
Teixeira—Salmela LF, Olney SJ, Nadeau S, et a1. Muscle strengthe-IIing and physical conditioning to reduce impairment and disability in chronic stroke survivors. Arch Phy8 Med Rehabil, 1999, 80 (10): 1211. 1218.

Quadriceps femoris and Hamstring muscles Theraband





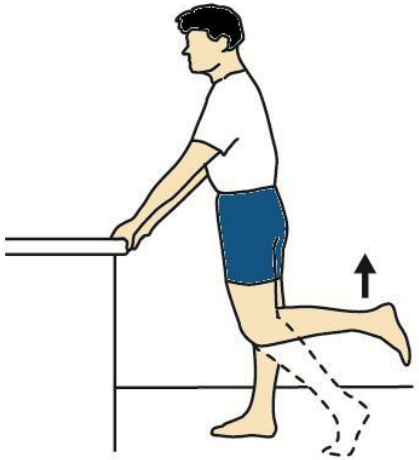




1 Methods towards muscle performance

➢Gastrocnemius muscle

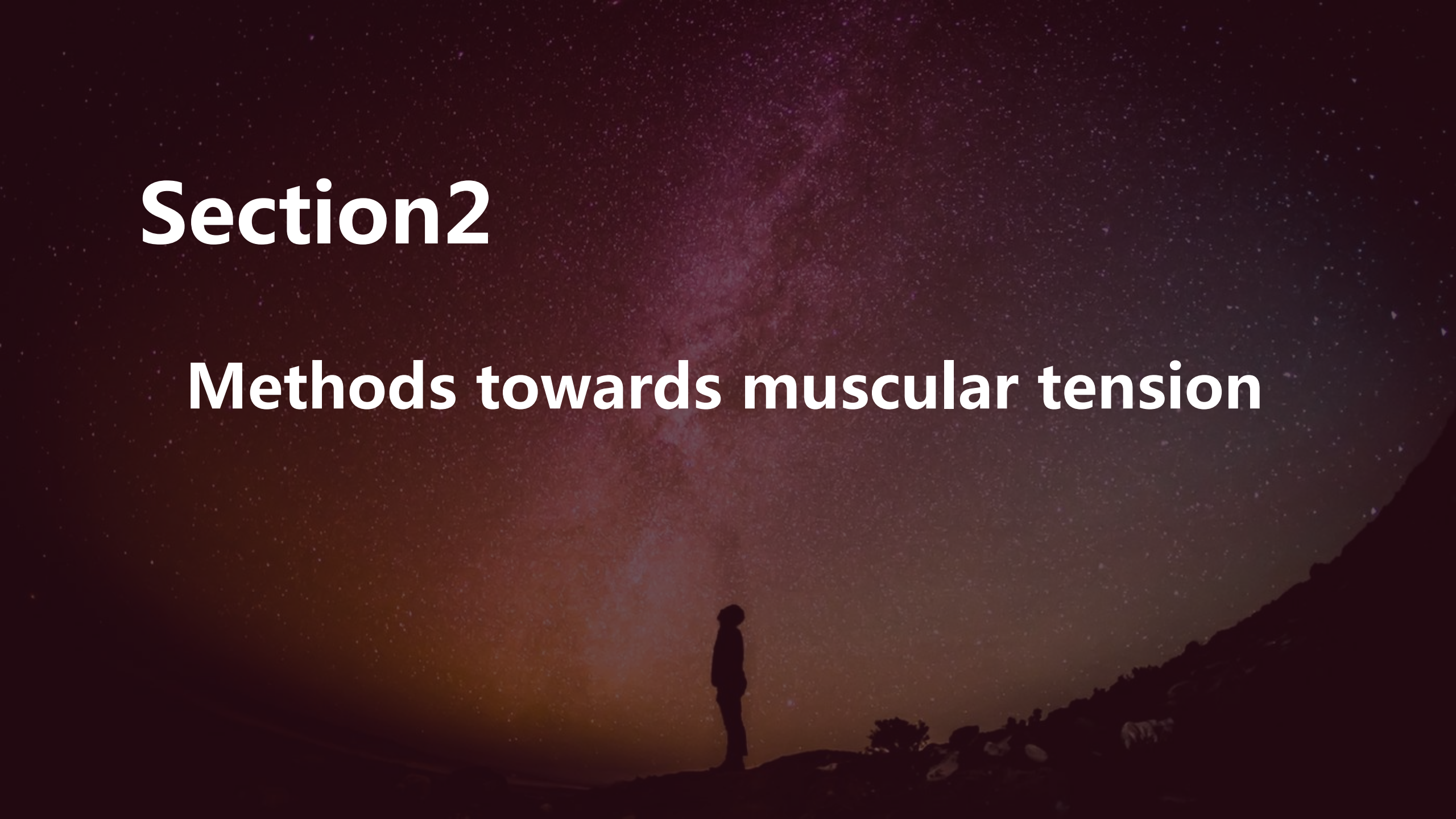
- Control the patient’s power and velocity: Avoid the spasm of the extensors , reduce the muscle tone of Gastrocnemius muscle



Ota S, Ueda M, Aimoto K, Suzuki Y, Sigward SM. Acute influence and methods of restricted ankle dorsiflexion angle on knee joint mechanics during gait. Knee 2014;21:669-675.

Section2

Methods towards muscular tension



2 Methods towards muscular tension

【High tension muscles】

- Quadriceps femoris
- Triceps surae
- Hip flexion contracture
- Achilles's tendon contracture

【Methods】

- Keeping in good position
- Slope training
- Stretching
- Proprioceptive Neuromuscular Facilitation(PNF)
- Physical agencies :Functional electrical stimulation(FES)
- Kinesio taping
- Botulinum toxin injection
- Acupuncture and moxibustion

Teixeira—Salmela LF, Olney SJ, Nadeau S, et a1. Muscle strengthe-IIing and physical conditioning to reduce impairment and disability in chronic stroke survivors. Arch Phy8 Med Rehabil, 1999, 80 (10): 1211. 1218.

2 Methods towards muscular tension

- **Keeping in good position**

Fig. 2

Fig. 3

2 Methods towards muscular tension

➢Slope training

【Position】 Stand in a 20 degree-slope

【Action】

- Weigh in on tiptoe and then relax
- Supported by the affected limb
- Step forward and backward

【Attention】 Step length no less than 10cm.

【Dosage】

- Stand 15minutes
- Weigh in on tiptoe for 10 seconds,10 times/group,3 groups total
- Step forward and backward 10 min/d

【Effect】

- Reduce the spasm of Gastrocnemius muscle
- Exercise the concentric and eccentric contraction of Gastrocnemius muscle

赵军. 脑卒中膝关节反张康复治疗分析. 中国康复理论与实践，2004，10(5)：319-319.
李奇，王磊等.“斜坡训练”改善脑卒中患者膝过伸的疗效观察.2008

2 Methods towards muscular tension

➢ Stretching

2 Methods towards muscular tension

➢ Proprioceptive Neuromuscular Facilitation(PNF)

Contract Relax: Passive placement of the restricted muscle into a position of stretch followed by an isotonic contraction of the restricted muscle.

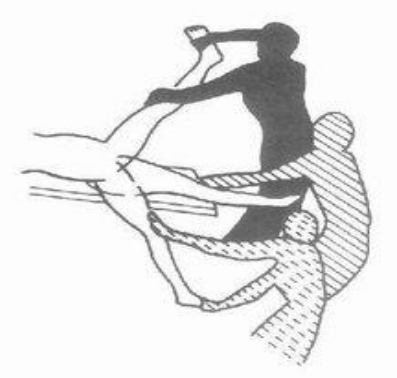
Hold Relax: Very similar to the Contract Relax technique. This is utilized when the agonist is too weak to activate properly.

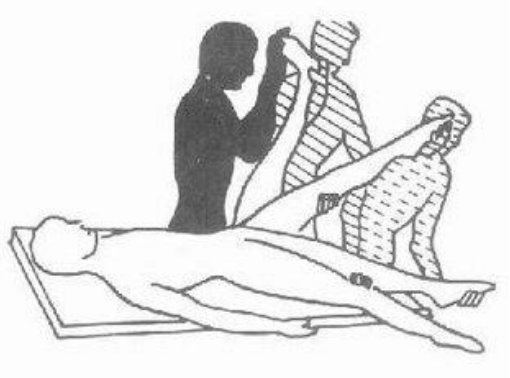
Contract Relax Agonist (Antagonist) Contract (CRAC) is usually performed by a passive or active stretch of the target muscle(s) to move the limb into a starting position at first, followed by a sub-maximal isometric contraction of the target muscle and finally an active stretch is used to move the limb into a new greater position.

Rhythmic Initiation:

Rhythmic Stabilization: and Alternating Isometrics are very similar in that they both encourage stability of the trunk, hip, and shoulder girdle.

Slow reversals: This technique is based on Sherrington's principle of successive induction





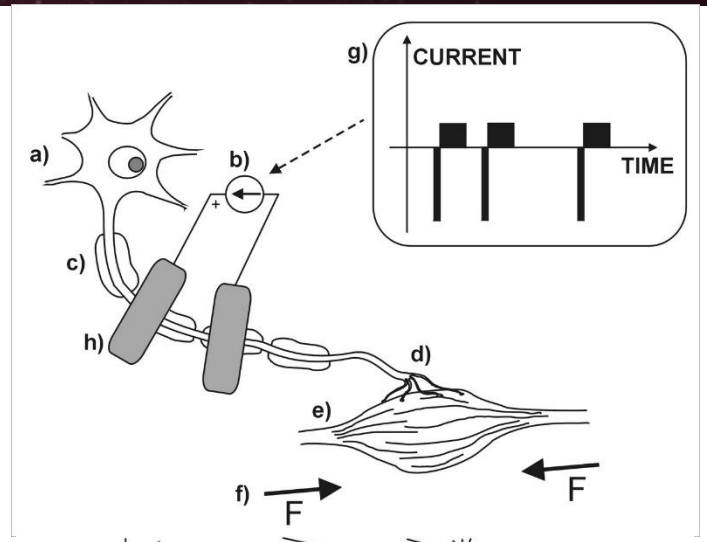
Sharman, M., Cresswell, A. and Riek, S. (2006). Proprioceptive Neuromuscular Facilitation Stretching. Sports Medicine, 36, 929-939.

2 Methods towards muscular tension

➢ Physical agencies

A. low frequency electrotherapeutics----FES【Methods】

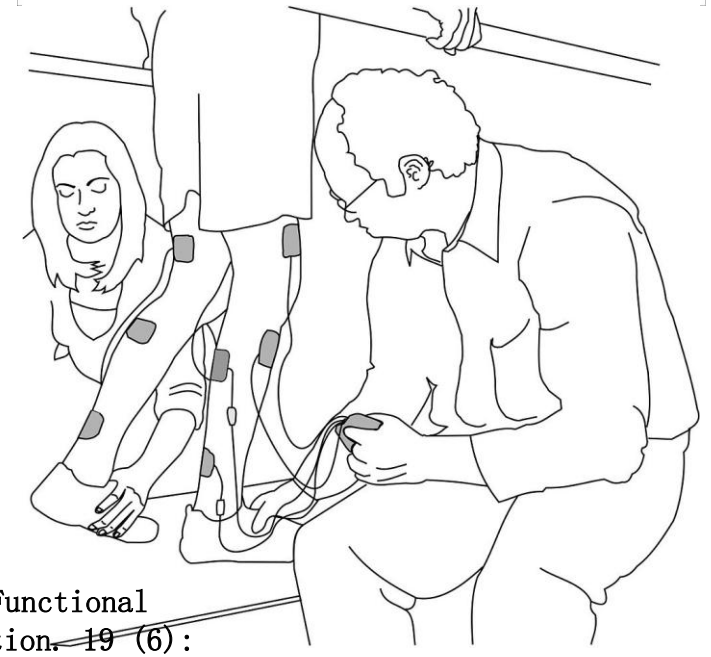
- 频率50～100，调幅度100%，将5cm×8cm的2个极片置于腘绳肌肌腹处，耐受限，20min，1次/d，2周为一疗程。



B. Intermediate frequency electrotherapeutics

【 Methods 】

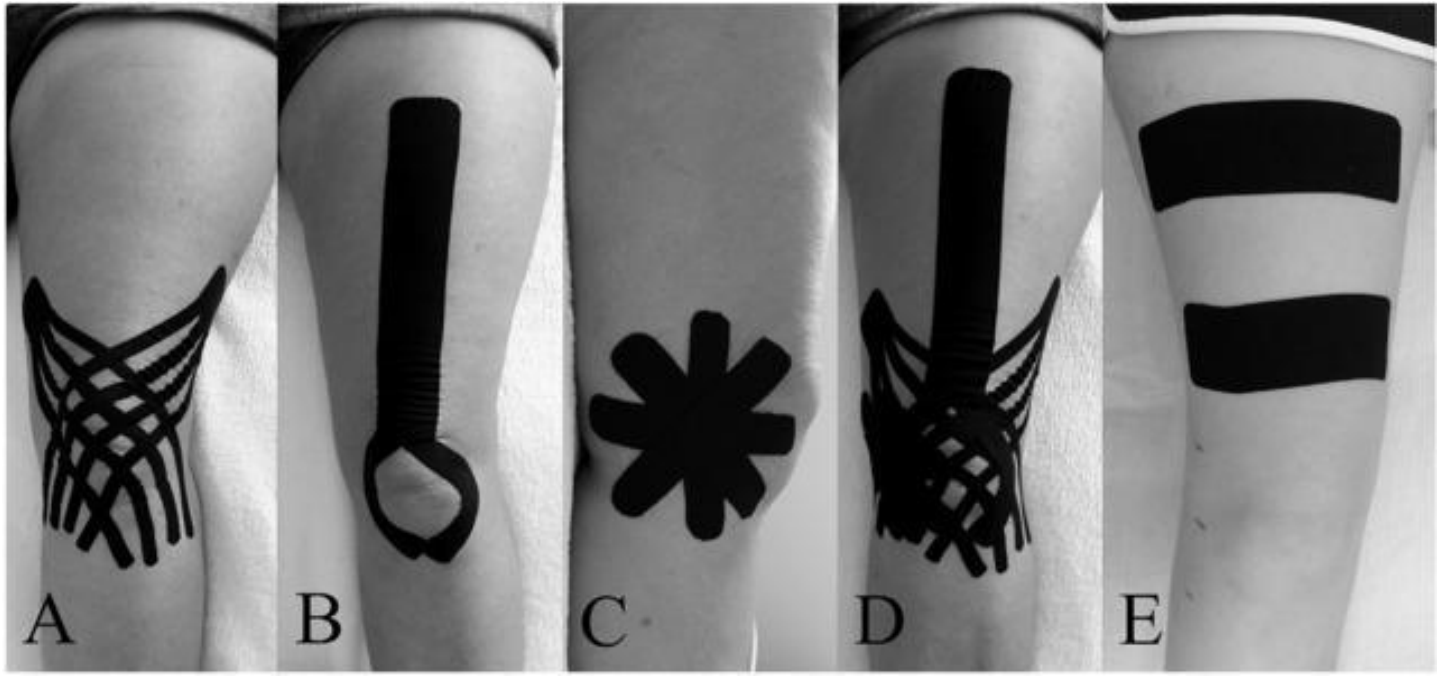
- 采用10～150Hz低频调制波，2000～5000Hz的中频载波，将8cm×10cm的2个极片置于腘绳肌肌腹处，耐受限，20min，1次/d，4周为一疗程。



[]Pereira, Shelialah; Mehta, Swati; McIntyre, Amanda; Lobo, Liane; Teasell, Robert W. (2012-12-01). "Functional electrical stimulation for improving gait in persons with chronic stroke". Topics in Stroke Rehabilitation. 19 (6): 491 - 498. doi:10.1310/tsr1906-491. ISSN 1074-9357. PMID 23192714.

2 Methods towards muscular tension

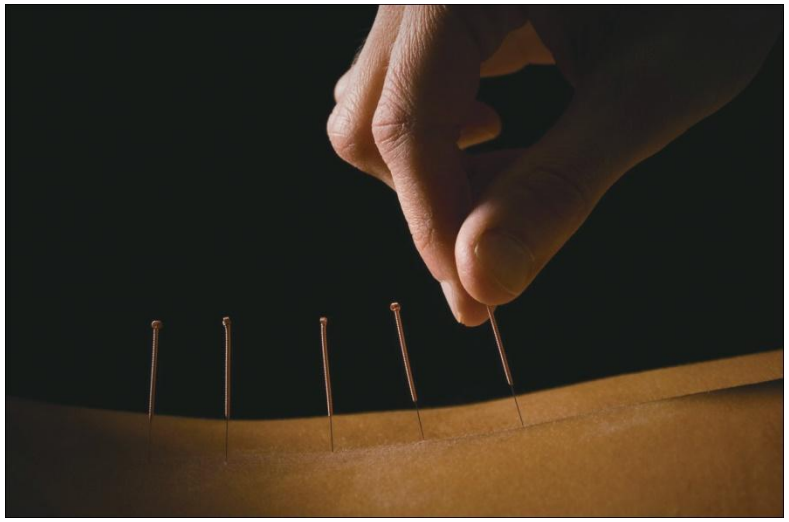
Kinesio taping



[]谢镇良，冯尚武，曹全荣等.肌内效贴在预防脑卒中偏瘫患者膝过伸的应用研究. R49；R743.3.3870zgkf. 2016. 02. 013
[]Flynn, Jonathon."How,When,And Why To Use Athletic Tape." BodyBuiding.com. TRAINmagazine, 20 May 2015. Web. 18 Oct. 2016

2 Methods towards muscular tension

➢ Acupuncture and moxibustion



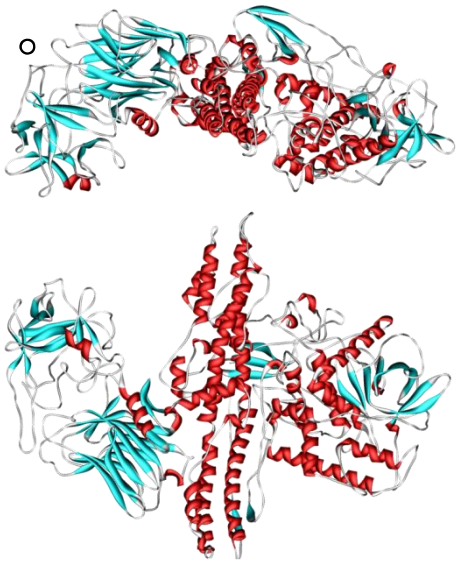
【Methods】

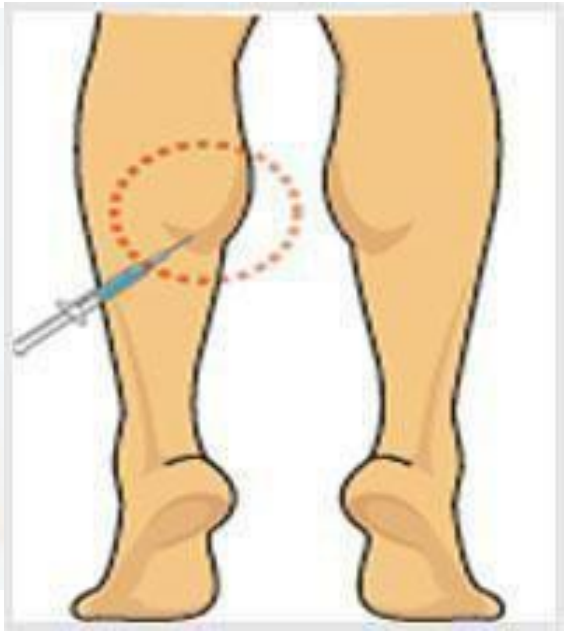
- 取穴选取膝关节附近的穴位血海、梁丘、犊鼻、阳陵泉、足三里、委中、委阳，患者取侧卧位，局部常规消毒后，采用深刺用提插捻转泻法，针刺得气后，留针30分钟，每5分钟行针1次，行针同时让患者感受膝关节感觉，10天为1个疗程，连续治疗2个疗程。

李红星， 罗利敏， 周红芳。 针刺治疗脑卒中后膝过伸13例[J]。 中国社区医师:医学专业， 2010， 12(36):142-142。

2 Methods towards muscular tension

➢ Botulinum toxin injection





Mangera A, Andersson KE, Apostolidis A, Chapple C, Dasgupta P, Giannantoni A, Gravas S, Madersbacher S (October 2011). "Contemporary management of lower urinary tract disease with botulinum toxin A: a systematic review of botox (onabotulinumtoxinA) and dysport (abobotulinumtoxinA)". European Urology. 60 (4): 784–95. doi:10.1016/j.eururo.2011.07.001. PMID 21782318.

Section3

Methods towards Priprioception

Methods towards Proprioception

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Balance Pad Training

The Knee Angle Regression Training

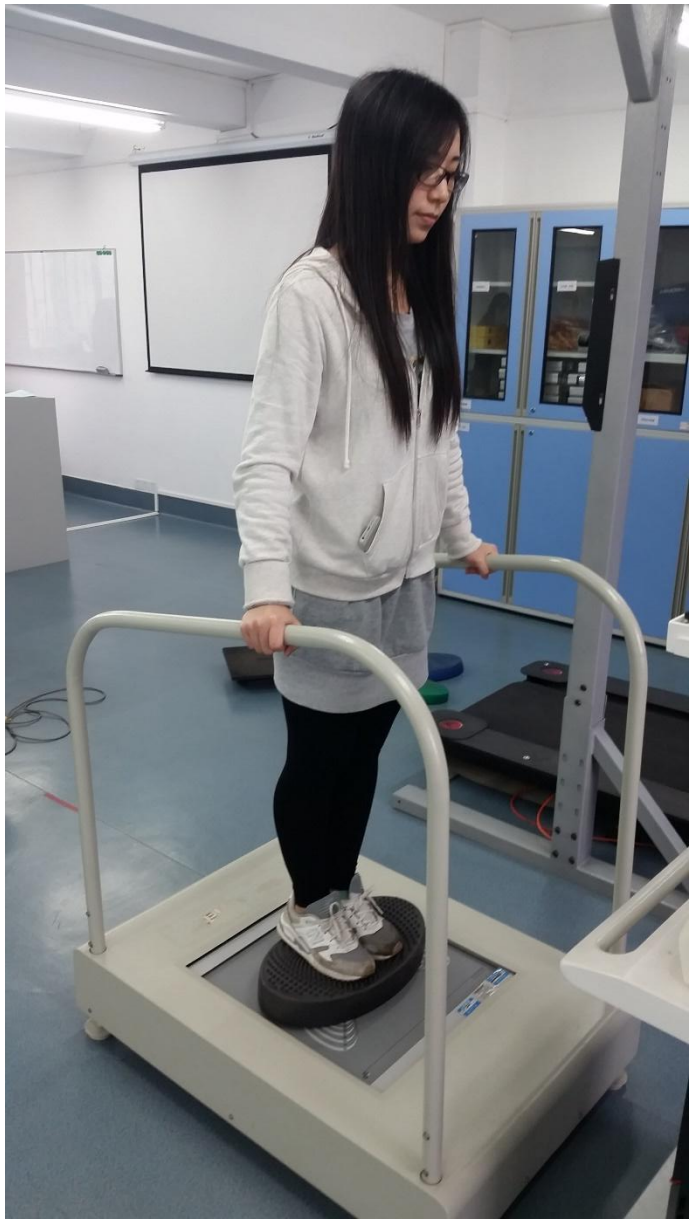
Open Chain Exercises of Elastic Belt

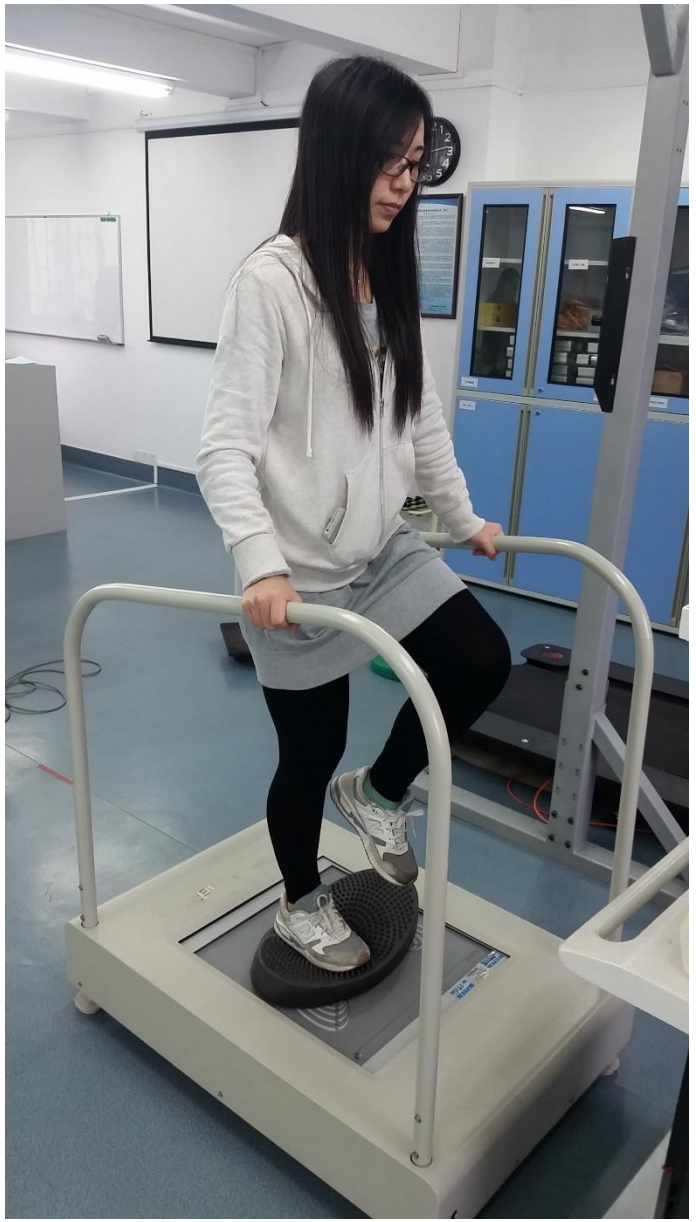
Pedal Training

韩秀兰， 刘开锋， 许轶， 王楚怀。膝关节本体感觉训练对偏瘫患者平衡功能的影响[J]。中国康复医学杂志。 2015，30(8):790-794

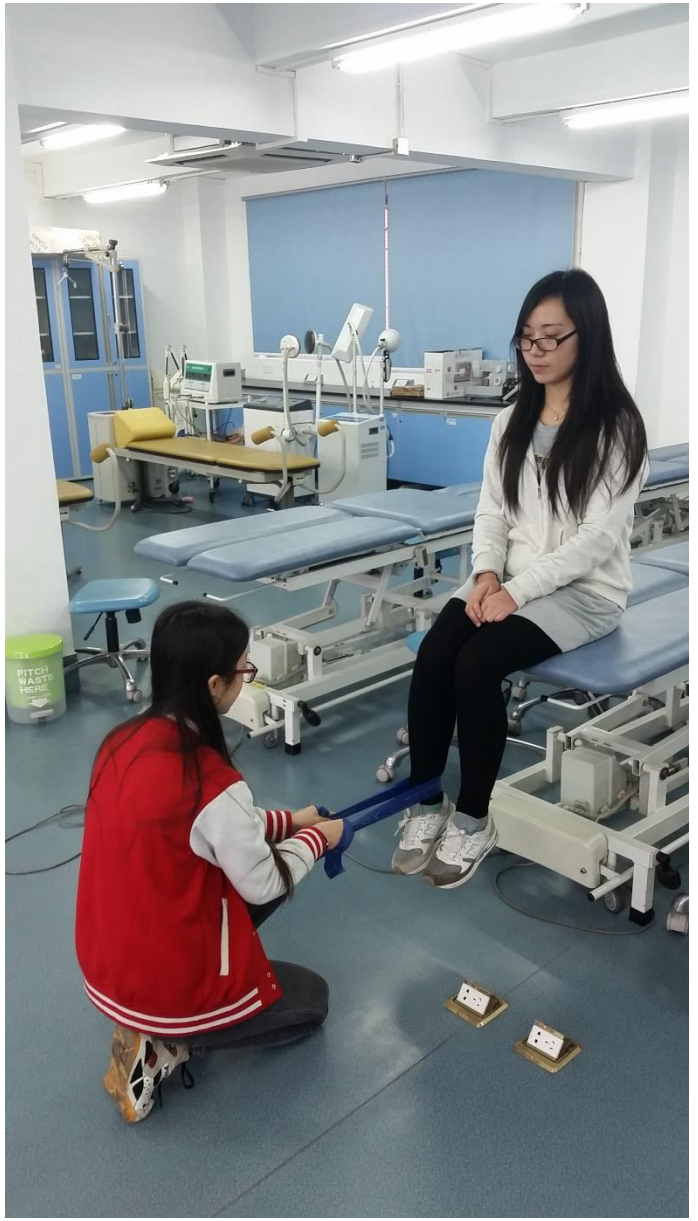
白海军 .平衡垫训练对女性膝骨关节炎患者膝关节 本体感觉影响的研究 [J].成都体育学院学报.2012.05.003

BALANCE PAD TRAINING





OPEN CHAIN EXERCISES OF ELASTIC BELT



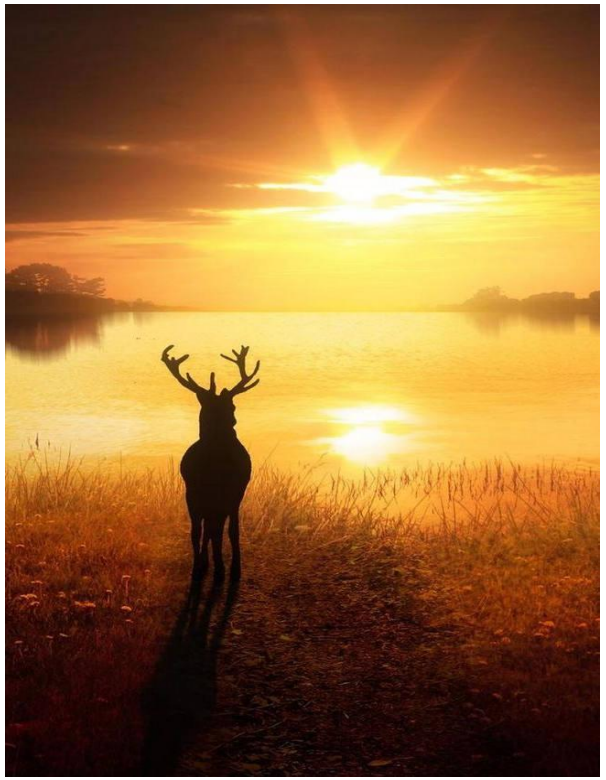
PEDAL TRAINING

THE KNEE ANGLE REGRESSION TRAINING

HOW TO DO?

1. Take the seat,the knee joint was moved to a certain position by the therapist.
2. Close the eyes and try to move knee to the target position.
3. Open the eyes to see if there are differences.
4. If there is any difference, repeat step2 with eyes open.
   If not, the patient should do fast, accurate practice repeatedly

10~20min/day
20~40times



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ATTENTION:

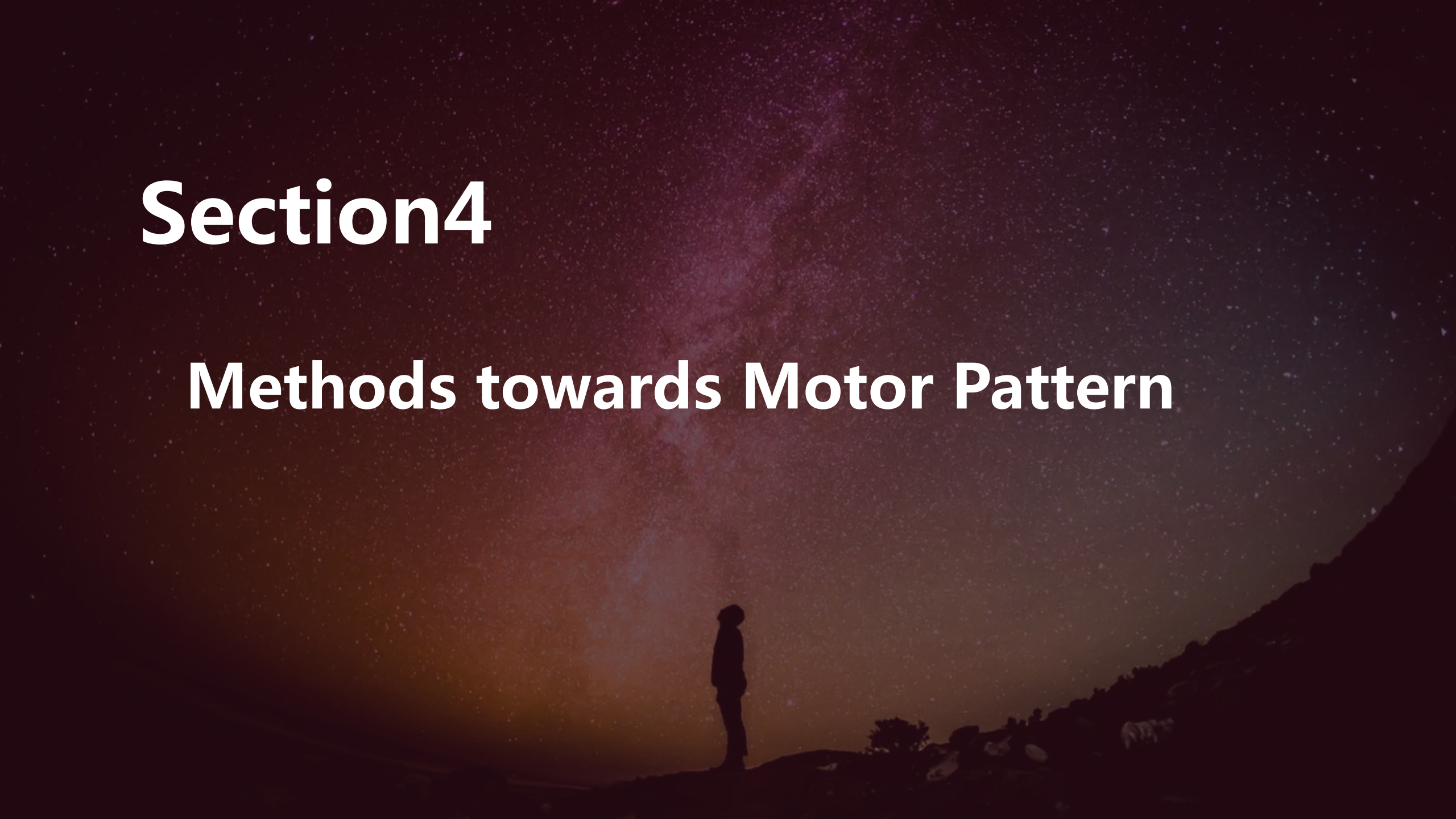
- ♦Hang on the lower leg
- ♦Popliteal does not contact the edge of the bed
- ♦Trunk and upper limbs remain motionless

Piriyaprasarth P,Morris ME,Delany C,et al. Trials needed to assess knee proprioception following stroke[J]. Physiotherapy Research International Physiother, 2009,14(1): 6—16 .

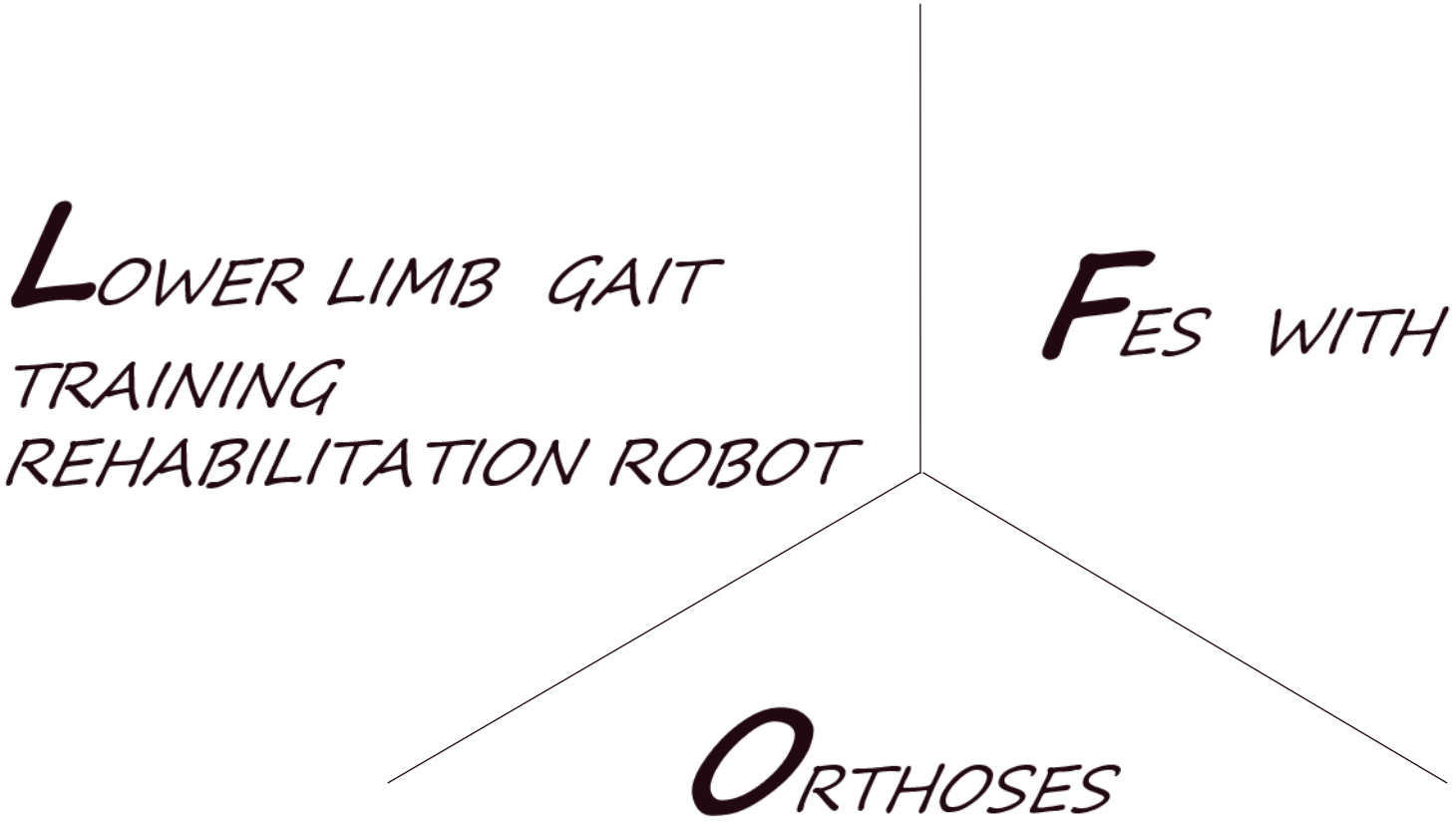
张鹏, 钱风雷, 封旭华, 等. 游泳运动员膝关节损伤康复中本 体感觉训练的应用[J]. 中国运动医学杂志,2010, 29(6): 640—642

Section4

Methods towards Motor Pattern



Methods towards Motor Pattern



Aurore Thibaut1, Camille Chatelle1, Erik Ziegler2, Marie-Aure ´lie Bruno1, Steven Laureys1, & Olivia Gosseries1. Spasticity after stroke: Physiology, assessment and treatment Brain Inj, Early Online: 1–13 ! 2013 Informa UK Ltd.
刘世文 , 王桂芳 ,李 贞兰 `,刘 松 .以躯干为主导的矫正脑卒中下肢非典型 异常运动模式的疗效分析中国康复医 学杂 志 , 20 0 4 年 , 第 19 卷 , 第 1 1 期

LOWER LIMB GAIT TRAINING REHABILITATION ROBOT

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ORTHOSES

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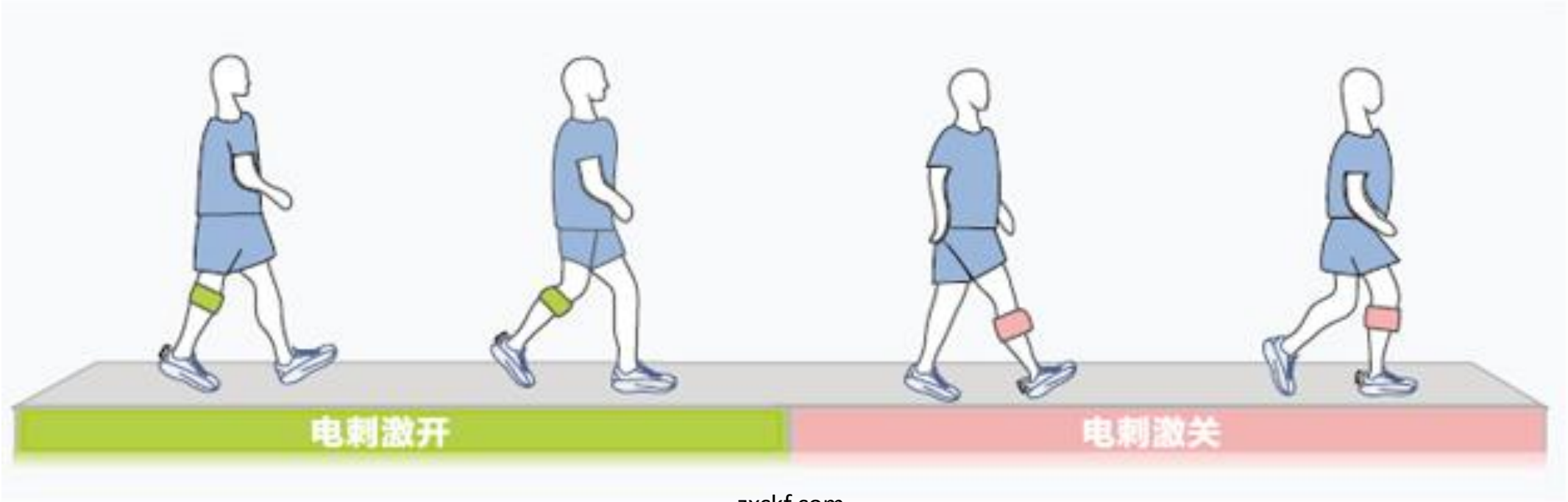
xhylqx.com

The aims of orthoses

- reduction in spasticity
- reduce the pain
- improve the function
- compensate the protective sensation
- prevent the contracture and deformity

Neuhaus BE, Ascher ER, Coullon BA, Donohue MV, Einbond A, Glover JM, Goldberg SR, Takai VL. A survey of rationales for and against hand splinting in hemiplegia. American Journal of Occupational Therapy 1981;35:83–90.

FES WITH VR



zxckf.com

♦FES(（functional electrical stimulation)*is a method to inducing muscle movement or simulating normal locomotor activity in order to improve or restore the function of the stimulated muscle or muscle group*

♦*By using a certain intensity of low frequency pulse current to stimulate a group or group of muscles*

Alon G, Levitt AF, McCarthy PA. Functional electrical stimulation (FES) may modify the poor prognosis of stroke survivors with severe motor loss of the upper extremity: a preliminary study[J]. Am J Phys Med Rehabil,2008,87:627—636.
McCabe JP, Dohring ME, Marsolais EB,et al. Feasibility of combining gait robot and multichannel functional electrical stimulation with intramuscular electrodes[J]. J Rehabil Res Dev,2008,45:997—1006.

FES WITH VR

- FES while allowing patients to walk on the tablet, synchronized with streets, parks, forests, sea views by using VR to Make the patient feel personally on the sense.
- The patient's heart rate should not exceed 80% of the predicted maximum heart rate . 20 - 30min/D, 6D/W
- Yang and Mirelman study has confirmed that the involvement of sensory feedback has a positive effect on rehabilitation.

virtualreality.net.au

Yang YR, Tsai MP, Chuang TY, et al. Virtual reality-based training improves community ambulation in individuals with stroke: a randomized controlled trial[J]. Gait Posture, 2008, 28 (2): 201—206.

Mirelman A, Patritti BL, Bonato P, et al. Effects of virtual reality training on gait biomechanics of individuals poststroke[J]. Gait Posture, 2010, 31(4): 433—437.

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30. Mirelman A, Patritti BL, Bonato P, et al. Effects of virtual reality training on gait biomechanics of individuals poststroke[J]. Gait Posture, 2010, 31(4): 433—437.

Thanks For Your Attention