

Complete Sports Rehab: Shoulder



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Webinar Structure

Interventions for Athletes

- **Joint Centration:** Addressing Mobility and Control
- **Neuromuscular Chains:** Tonic and Phasic
- **Muscle Slings:** Anterior and Posterior Trunk Slings
- **Open Kinetic Chain vs Closed Kinetic Chain:** Research and Application
- **Stable vs Suspension:** Research and Application

Joint Centration

Addressing Mobility and Control

Case

- Report
 - Shoulder pain passing and shooting while playing water polo
- Movement fault
 - Glenohumeral joint internal rotation mobility deficit
 - Decreased joint centration
- Intervention
 - PICR and band hitch



Monitor Scapula Versus Humerus



Intervention



Step 1



Step 2

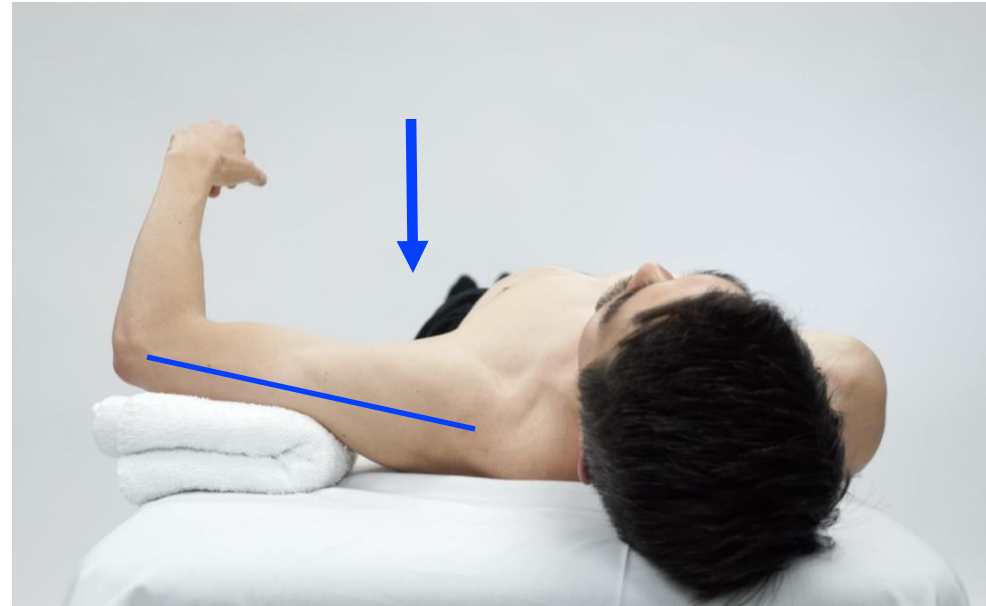
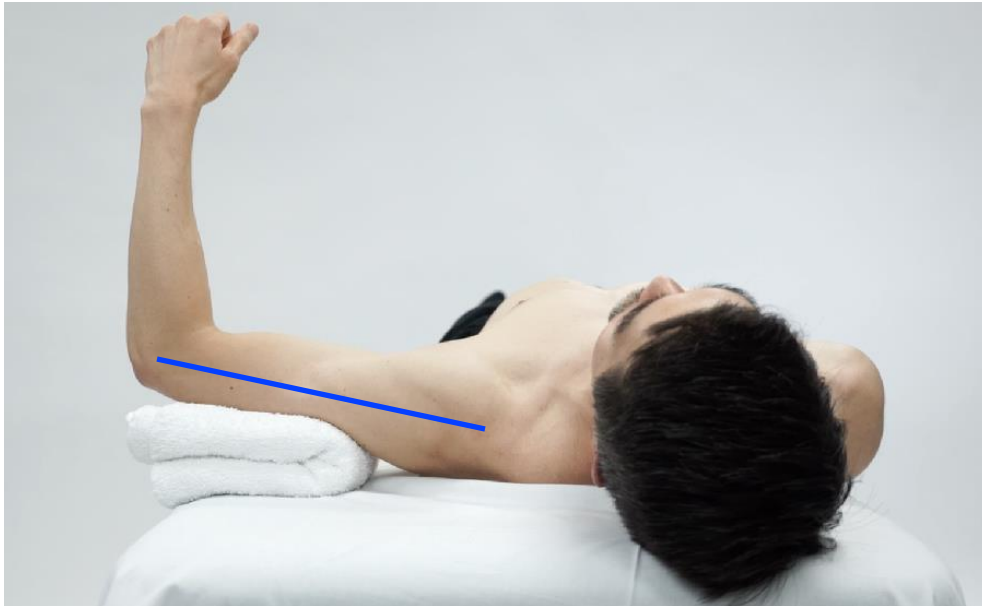


Step 3

Step 1



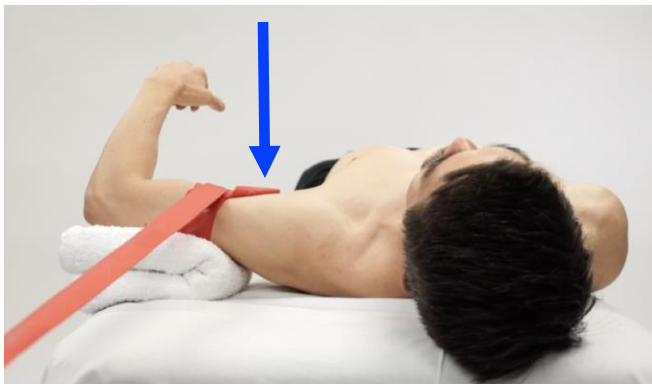
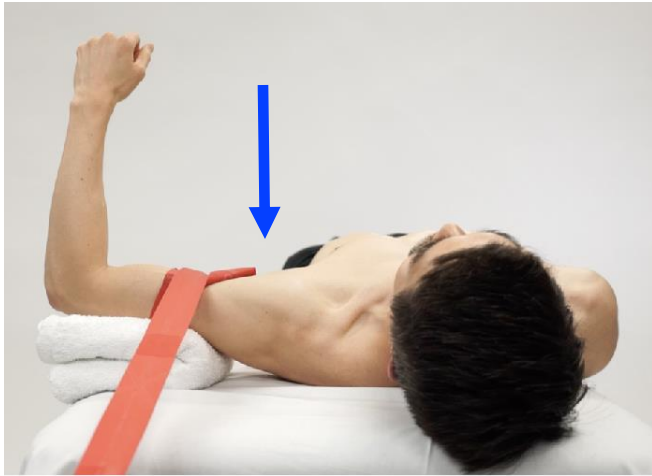
Step 2



Glenohumeral Joint Centration

- Support the humerus with a folded towel
- Rotate the humerus into medial rotation while maintaining posterior glide of the humeral head into the back of the table
- Return to the starting position

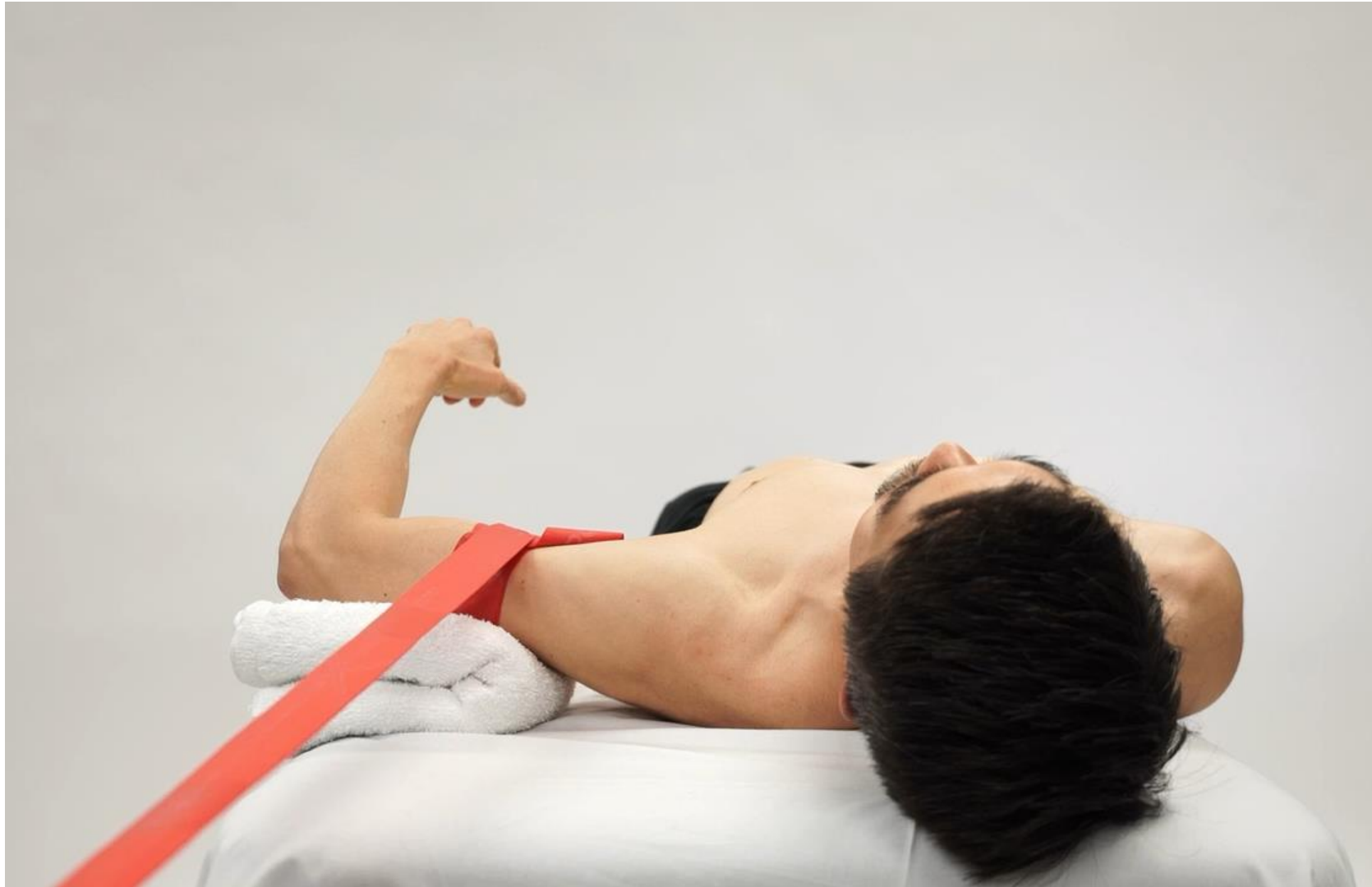
Step 3



Joint Centration with Rotation

- Support the humerus with a folded towel
- Wrap a CLX band around your humerus so that it resists medial rotation and have a therapist hold the band or fixate it to a stationary object
- Rotate the humerus into medial rotation while maintaining posterior glide of the humeral head into the back of the table
- Return to the starting position

Step 3



Wrapping the Band

How to wrap the band to resist humeral medial rotation



Wrapping the Band



With a Laser



Research: Mechanisms of Joint Centration

- The joint force at end-range positions was more anteriorly directed than at mid-range
- This indicates that its contribution to glenohumeral joint stability was diminished
- In end-range positions, simulated increases in rotator cuff muscle forces improved stability whereas increases in deltoid or pectoralis major muscle forces decreased stability
- Increased rotator cuff function at end ranges improves joint stability

Neuromuscular Chains

Tonic and Phasic

Neuromuscular Chains

Tonic System	Phasic System
Older system	Younger system
Flexor system	Extensor system
Tend to shorten	Tend to lengthen/atrophy
Overactivation	Delayed activation
Dominant <ul style="list-style-type: none">• Intrauterine & early infancy• Sedentarism and deconditioning• Old age and injury	Recessive <ul style="list-style-type: none">• Requires higher CNS control• Easily inhibited

Tonic Muscle Chain

Upper Half

- Pec major
- Pec minor
- Upper Trapezius
- Levator Scapulae
- SCM
- Scalenes
- Suboccipitals
- Upper limb Flexors
- Thoracolumbar Extensors

Lower Half

- Hip Flexors
- Hip Adductors
- Hamstrings
- Gastroc-Soleus
- Piriformis
- Quadratus Lumborum

Phasic Muscle Chain

Upper Half

- Serratus Anterior
- Mid Trap
- Lower Trap
- Rhomboids
- Deep neck Flexors
- Upper limb Extensors

Lower Half

- Peroneals
- Tibialis Anterior
- Quadriceps
- Gluteus Medius
- Gluteus Minimus
- Gluteus Maximus
- Abdominals

Phasic Quadruped



Phasic Seated



Phasic Standing



Assisted Phasic Trunk Activation



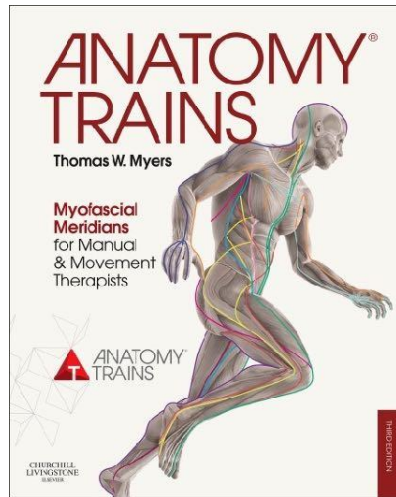
Self Phasic Trunk Activation



Muscle Slings

Anterior and Posterior Trunk Slings

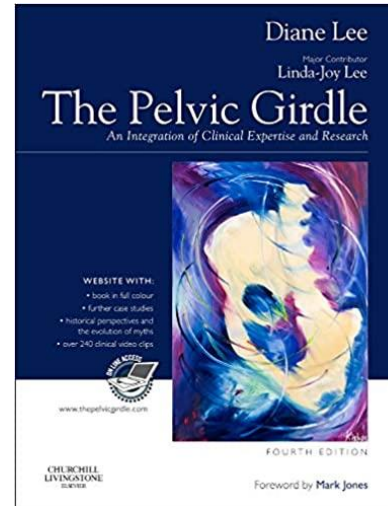
Muscle Slings



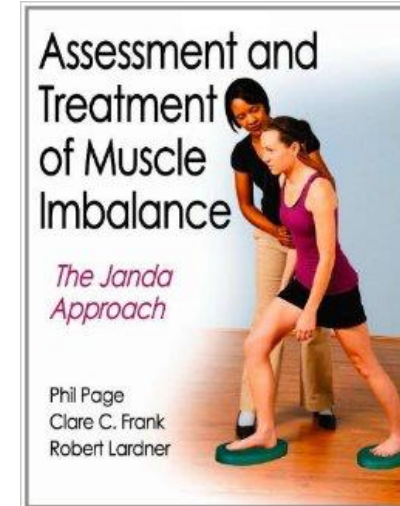
Myers



Vleeming



Lee



Frank

- Muscles are interconnected through the fascial system
- Slings, lines, and trains provide movement and stabilization across multiple joints

Case

- Report
 - A rock climber reports difficulty climbing an overhanging rock route
- Movement fault
 - Inadequate use of sideways flagging technique
- Intervention
 - Anterior trunk sling movement training



Sideways Flag

Using a free-hanging foot to counterbalance your center of mass to gain more reach or prevent swinging off the wall



Anterior Trunk Sling

- Ipsilateral biceps
- Ipsilateral pectoralis major
- Contralateral internal oblique
- Contralateral hip adductors
- Contralateral sartorius
- Contralateral quadriceps

Anterior Trunk Sling



Sideways Flag



Anterior Medial Reach (AM)

Climbing Specific Star Excursion



Case

- Report
 - Pole vaulter with right sided shoulder pain during the take-off phase of the pole vault
- Movement fault
 - Inadequate isometric stability of the right shoulder coupled with left hip extension
- Intervention
 - Posterior trunk sling progression



Case



Posterior Trunk Sling

- Ipsilateral triceps
- Ipsilateral latissimus dorsi
- Contralateral thoracolumbar fascia
- Contralateral gluteus maximus
- Contralateral hamstrings

Open Kinetic Chain vs Closed Kinetic Chain

Research and Application

Case



- Report
 - Recreational softball team with several players reporting shoulder discomfort and difficulty throwing from outfield to the bases
- Movement fault
 - Shoulder weakness
- Intervention
 - Closed kinetic chain exercises

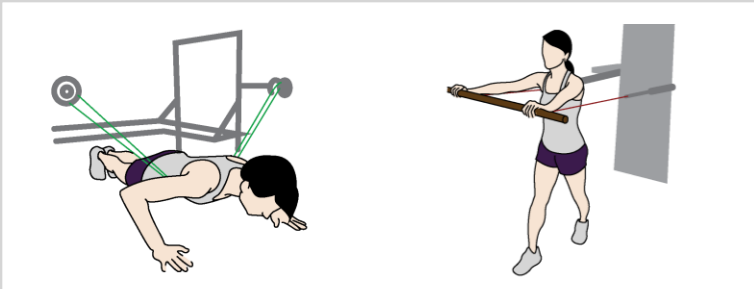
CKC Research

- CKC vs OKC exercises
- 5-repetition max
- EMG Infraspinatus (INF) Deltoid (DEL) Serratus anterior (SA) Upper, middle and lower trapezius (UT, MT, LT) Erector spinae (ES) External oblique (EO)
- > activation in CKC vs OKC for INF, LT, ES, and EO

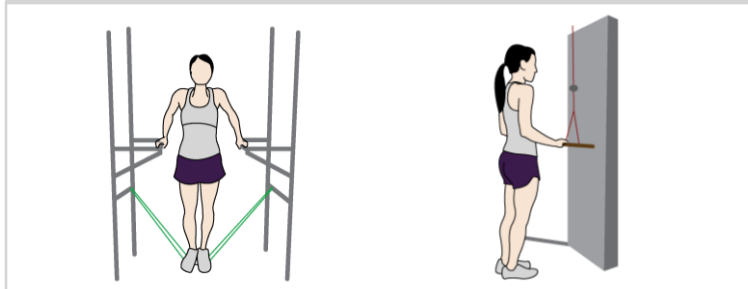
Upper extremity CC exercises generated greater activation of shoulder and trunk muscles compared to OC exercises

CKC versus OKC

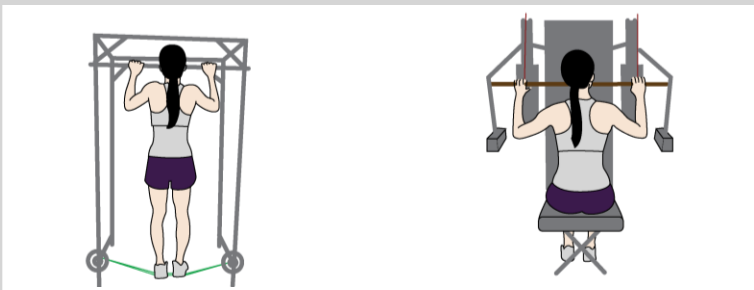
Push-up - Horizontal Press



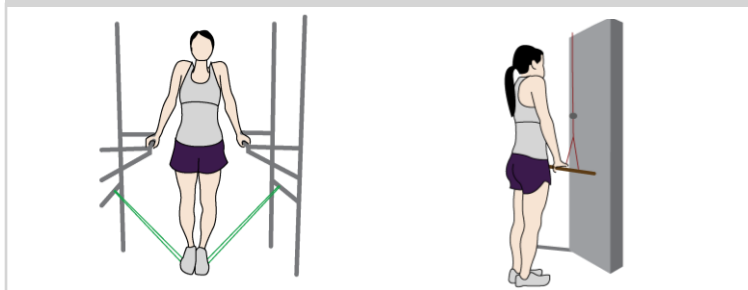
Tricep Dips - Tricep Curls



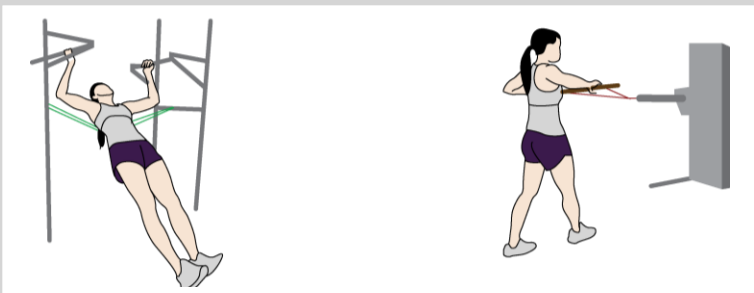
Chin-up - Lat Pull Down



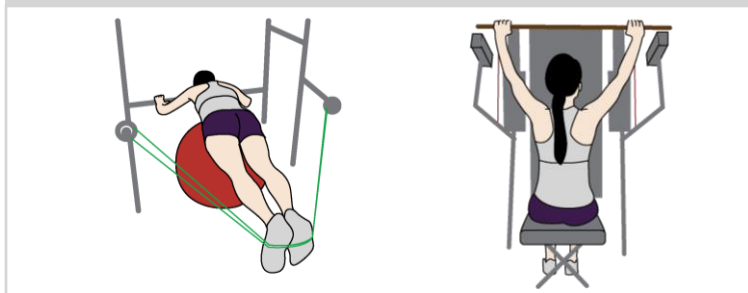
Shoulder Depression - Scapular Depression



Inverted Row - Horizontal Row



Vertical Press - Vertical Press



Level 1 and 2

Level 1 Start



Level 1 Finish



Level 2 Start



Level 2 Finish



Ways to Address the Kinetic Chain

1. Neuromuscular Chains
 - Tonic
 - Phasic
2. Muscle Slings
 - Anterior Trunk Sling
 - Posterior Trunk Sling
 - Spiral Trunk Sling
3. Closed Kinetic Chain
 - Arm on Body versus Body on Arm
4. Unstable Surfaces
 - Floor versus suspension exercises

Level 1 and 2



Level 3



Level 4



Stable vs Suspension

Research and Application

Case



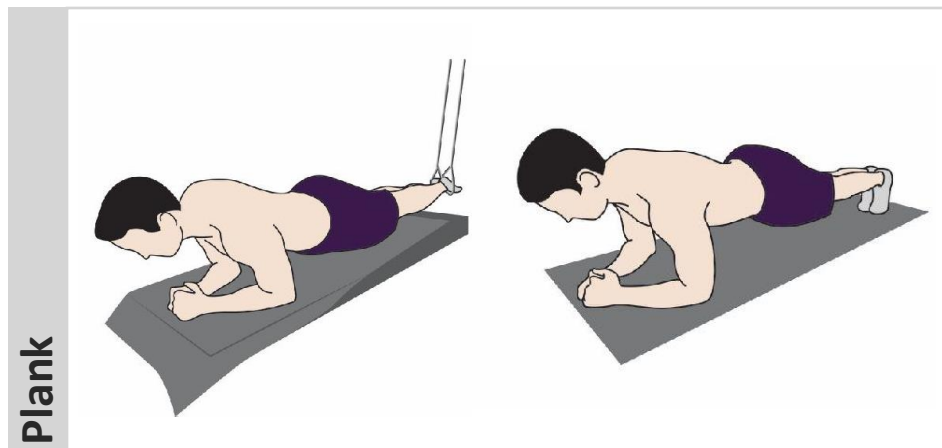
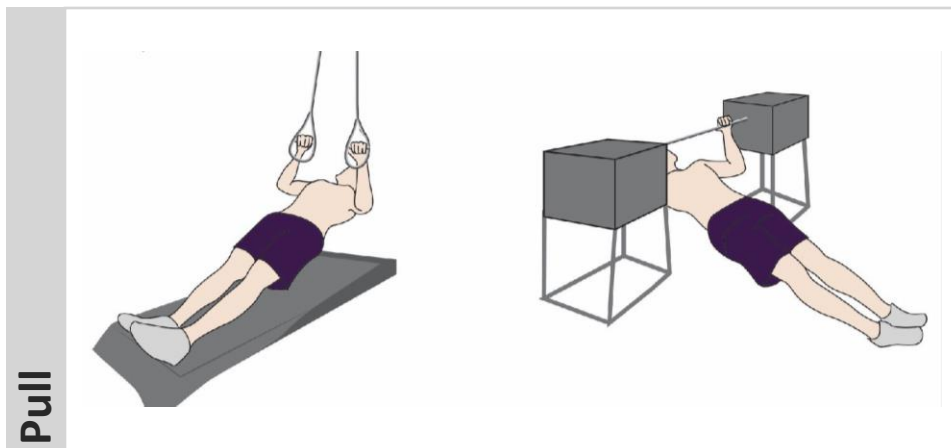
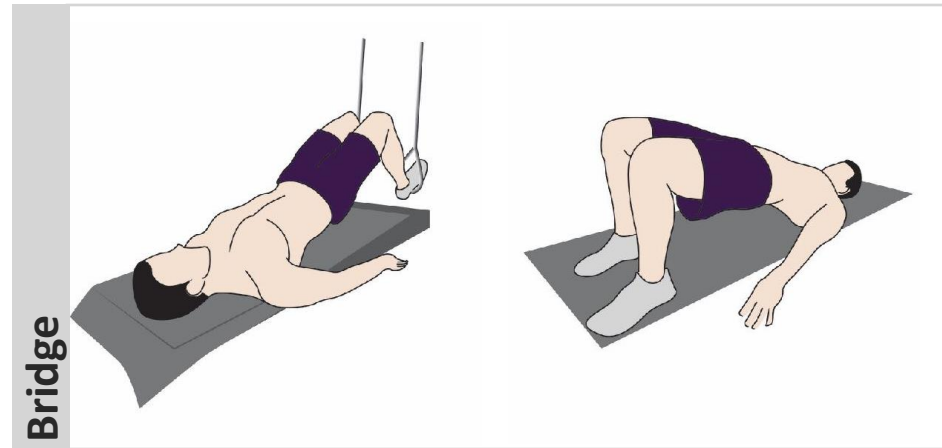
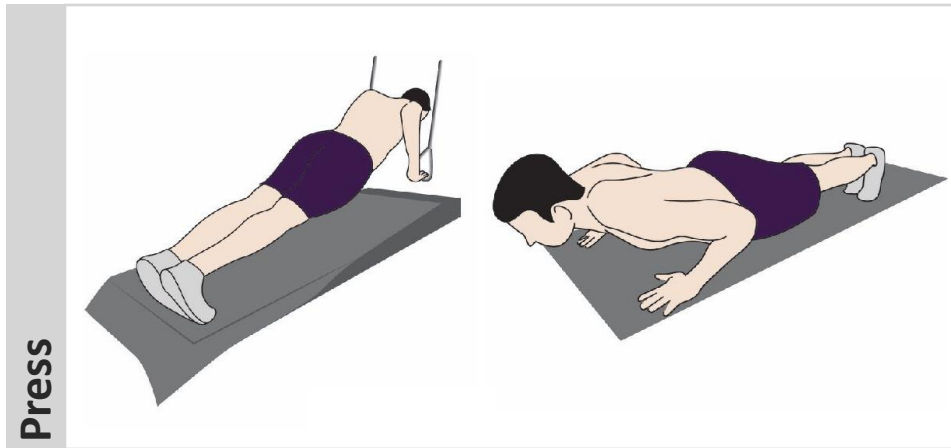
- Report
 - Female basketball player 10 weeks s/p shoulder subluxation
- Movement fault
 - Glenohumeral instability with reaching (defense) and passing
- Intervention
 - Closed kinetic chain exercises

Suspension Training Research

- Muscle activation assessed with Suspension vs Floor Exercises
- EMG Pectoralis major (PM) Middle deltoid (MD) Serratus anterior (SA) Obliques (OB) Rectus abdominis (RA) Gluteus maximus (GM) Erector spinae (ES) Middle trapezius/rhomboids (MT)
- ↑ muscle activation with suspension vs floor to exercises

Performing suspension training exercises increases muscle activation of selected muscles when compared to exercises performed on a stable surface

Stable Versus Suspension



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Images Copyright Jared Vagy DPT Adapted from: Harris, S., Bjork, E., Brewer, W. and Ortiz, A. (2015). Muscle Activation Patterns during TRX Suspension Training Exercises. *Medicine & Science in Sports & Exercise*, 47, p.937.

Intervention Level 1 and 2

Level 1 Start



Level 1 Finish



Level 2 Start



Level 2 Finish



Intervention Level 3 and 4

Level 3 Start



Level 3 Finish



Level 4 Start



Level 4 Finish



Intervention Level 1 and 2



Summary

- Joint centration, neuromuscular chains, muscle slings, closed kinetic chain, and suspension exercises are all techniques that can be used to create a comprehensive shoulder intervention program for athletes
- Joint centration and rotator cuff activation are important for glenohumeral stability, especially at end range where anterior shear increases and stability decreases
- Muscle slings can utilize concepts of fascial connections, allowing force transmission and coordinated movement across multiple joints and body regions
- Neuromuscular chains (tonic vs phasic) can be utilized in both the upper and lower extremities to restore innate balanced movement patterns
- Closed kinetic chain and suspension training improve shoulder and trunk muscle activation more than open chain or stable surface exercises

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This course series teaches you how to use the movement system to assess, diagnose and treat athlete movement dysfunction. This series covers both the upper half and lower half of the body.

The material is highly interactive with an emphasis on the practical application of principles covered in the course. At the conclusion of the course, you will have a greater understanding of how to integrate movement-based assessments into sport-specific treatments.



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