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ERGONOMICS & MUSCLE PHYSIOLOGY AS APPLIED TO CYCLING

- As with anything exercise has risks and benefits. When starting a new exercise program it is recommended that guidance is sought to identify the risk vs. the benefits. A good place to start is with PAR-Q self assessment. PAR- Q is available online at: http://www.csep.ca/cmfiles/publications/parq/par-q.pdf The PAR-Q may indicate that you check with your physician prior to starting a new exercise program. In such cases this is highly recommended.
- The following information is not meant to replace professional guidance for exercise. No warranties are expressed with posting this information and should an individual decide to attempt exercises or follow information outline in the following information they do so at their own risk. Individuals understand that the information is general and may not be appropriate for any specific individual.

Learning Objectives

- The learner will
  - Have a basic knowledge of muscle fiber type.
  - Have a basic knowledge of muscle contraction type.
  - Become familiar with which muscle become tight and which inhibited in general and specifically with cycling.
  - Become familiar with the primary muscles involved with an affected by cycling.
  - Using above combination of factors understand the science behind a cycling specific exercise program.

Types of Muscles

Type I

- Endurance
- Aerobic Energy Stores and Metabolism
- Staying Power
  - Polka Dot Jersey

Type II

- Power
- Anaerobic Energy Stores
- Quick Acting and Quick Fatiguing
  - Green Jersey

Types of Contraction

- Concentric- Muscle Shortens while producing force
  - Weakest
- Isometric- Muscle Does Not change length while producing force.
  - Middle
- Eccentric- Muscle Lengthens while producing force.
  - Strongest
  - DOMs
  - Increase in girth

Janda Muscle Imbalances

Tonic (Prone to Tightness)

- Gastroc-Soleus
- Hip Adductors
- Hamstrings
- Rectus Femoris
- Iliopsoas
- Tensor Fascia Lata
- Piriformis
- Erector-Spinae (thoraco-lumbar)
- Suboccipital muscles
- Quadratus Lumborum
- Pectoralis Major & Minor
- Latissumus Dorsi
- Upper Trapezius
- Levator Scapulae
- Scalenes
- Sternocleidomastoid

Phasic (Prone to Weakness)

- Peroneals
- Tibialis Anterior
- Vastus Medialis
- Vastus Lateralis
- Gluteus Maximus
- Gluteus Medius
- Transversus Abdominus
- Multifidus
- Rectus Abominus
- Abdominal Obliques
- Serratus Anterior
- Rhomboids Lower & Middle
- Trapezius
- Deep neck flexors

http://www.muscleimbalancesyndromes.com/what-is-muscle-imbalance/

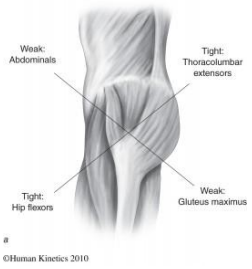
Janda's Upper Cross Syndrome

- Upper-Crossed Syndrome (UCS) is also referred to as proximal or shoulder girdle crossed syndrome
- Tightness of the upper trapezius and levator scapula on the dorsal side crosses with tightness of the pectoralis major and minor.
- Weakness of the deep cervical flexors ventrally crosses with weakness of the middle and lower trapezius.
- This pattern of imbalance creates joint dysfunction, particularly at the atlanto-occipital joint, C4-C5 segment, cervicothoracic joint, glenohumeral joint, and T4-T5 segment. Janda noted that these focal areas of stress within the spine correspond to transitional zones in which neighboring vertebrae change in morphology.
- Specific postural changes are seen in UCS, including forward head posture, increased cervical lordosis and thoracic kyphosis, elevated and protracted shoulders, and rotation or abduction and winging of the scapulae.
  - These postural changes decrease glenohumeral stability as the glenoid fossa becomes more vertical due to serratus anterior weakness leading to abduction, rotation, and winging of the scapulae.
  - This loss of stability requires the levator scapula and upper trapezius to increase activation to maintain glenohumeral centration (Janda 1988

http://www.muscleimbalancesyndromes.com/janda-syndromes/upper-crossed-syndrome//

Janda's Lower Crossed Syndrome

- Lower-Crossed Syndrome (LCS) is also referred to as distal or pelvic crossed syndrome.
- Tightness of the thoracolumbar extensors on the dorsal side crosses with tightness of the iliopsoas and rectus femoris.
- Weakness of the deep abdominal muscles ventrally crosses with weakness of the gluteus maximus and medius.
- This pattern of imbalance creates joint dysfunction, particularly at the L4-L5 and L5-S1 segments, SI joint, and hip joint.
- Specific postural changes seen in LCS include anterior pelvic tilt, increased lumbar lordosis, lateral lumbar shift, lateral leg rotation, and knee hyperextension.
  - If the lordosis is deep and short, then imbalance is predominantly in the pelvic muscles;
  - If the lordosis is shallow and extends into the thoracic area, then imbalance predominates in the trunk muscles (Janda 1987).



http://www.muscleimbalancesyndromes.com/janda-syndromes/lower-crossed-syndrome/

Cycling Muscles

Tight

- Neck Extensors/Upper Trapezius
- Pectorals
- Low back long extensors
- Hip flexors
- Hamstrings
- Tensor Fascia Lata/ITB
- Calf/Gastroc

Inhibited

- Deep Neck Flexors
- Lower rhomboids/Lower Traps
- Low back short stabilizers
- Transverse abdominals
- Glut Max/Quadriceps
- Glut Med
- Pretibial/Anterior Tibialis

Tight (red) vs. Inhibited (blue)

Exercises

Inhibition/Active Stretches

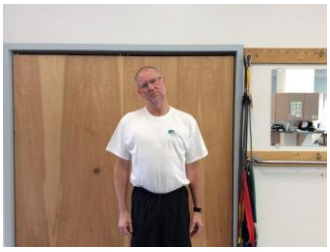
- Upper Trap Stretch
- Pectoral Minor Stretch
- Erector Spinae Foam Rolling
- Hamstring Foam Rolling and Stretching
- Calf Foam Rolling and Stretching

Facilitation/Strengthening

- Deep Neck Flexor Activation
  - Chin tuck head lift
- Lower Trap, Rhomboid and Segmental Back Activation
  - Planks
- Quad and Glut Max Activation
  - Bird Dips
- Quadriceps Activation
  - Bulgarian Squat

Active Upper Trap Stretch

- Tilt your head straight to one side (ear to shoulder)
- When you start to feel a stretch stop.
- Push your hand opposite the tilt down your leg
- Hold 10 sec.
- Take up slack from neck
- Repeat 3 times

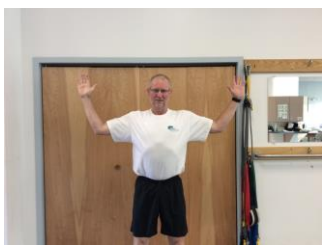


Chin Tuck Head Lift

- Lying on your back tuck your chin in elongating your neck.
- Keeping your chin tucked attempt to unweight your head from the supporting surface.
- Start by holding 10 secs.
- Repeat 3 times

Active Pec Stretch

- Standing raise your arms parallel to the floor.
- Roll forearms perpendicular to the floor.
- Pinch your shoulder blades down towards the opposite hip.
- Hold 10 secs
- Repeat 3 times

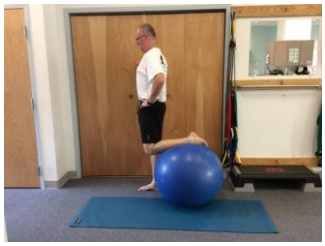


Cycling Plank

- Assume push-up position with elbows extended.
- Pull your belly button up and in and your shoulder blades down and back.
- Walk your hands towards your feet.
- Hold 10 secs
- Walk to starting position.
- Repeat 5 times.

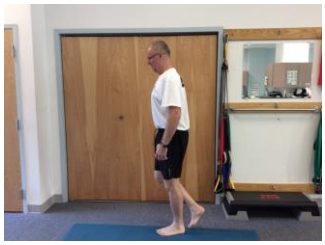
Active Hip Flexor Stretch

- Standing on one foot with your other knee on a gym ball.
- Stand straight with your belly button up and in.
- Using your buttock push the ball back while keeping your upright and your stomach tight.
- Hold 10 sec
- Repeat 3 times



Bird Dips

- Standing on one foot.
- Keep your shoulders over your hips and your hips level.
- Keep the knee of the leg you are standing on slightly bent.
- Bend at the waist keeping stomach tight.
- Return to starting position.
- Repeat 10 times.



Bulgarian Squat

- Standing on one foot with the other foot on a chair with knee bent.
- Do a single leg squat.
- Keep your knee cap behind your toe.
- If you can go down further move your front foot out.
- Repeat to fatigue.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