



# **FITNESS & NUTRITION EXPERT PROGRAM**

## **FITNESS SESSION 8:**

Levels, Modifications and Injuries



## What we are going to cover



### **TEACHING A MIXED LEVEL GROUP:**

- How to offer level systems
- Positive Context

### **RPE CHART:**

- What it is and how to effectively use this tool with clients

### **MODIFICATIONS:**

- Setting clients up for success with injuries or specific requirements

### **INJURIES:**

- Setting clients up for success
- Common injuries and modification options

## What we are going to cover



**INFLAMMATION**

**MUSCULO-SKELETAL INJURIES: SPRAINS VS STRAINS**

**MUSCULO-SKELETAL INJURIES: SPINE, BACK AND CORE**

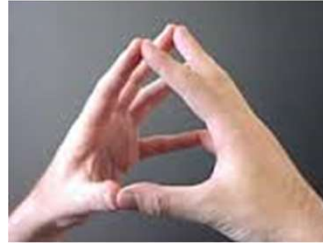
**CARDIO – RESPIRATORY CONDITIONS**





## What you need before we start

1. Water
2. Put your finger tips together
3. Take 3 deep breaths





## MIXED LEVEL PROGRAMMING

## MIXED LEVEL PROGRAMMING

Number 1 question and how to  
answer it



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## MIXED LEVEL PROGRAMMING

Remove the word “can’t” from your vocabulary



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## MIXED LEVEL PROGRAMMING

Want to challenge but never  
overwhelm



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## MIXED LEVEL PROGRAMMING

Inclusive programming, language,  
cueing and demonstrating



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## MIXED LEVEL PROGRAMMING

Non competitive environment



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## MIXED LEVEL PROGRAMMING



**Your vibe  
speaks  
volumes  
louder than  
any words  
could ever  
speak.**

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THE VERTICAL WORKSHOP

- Positive context ONLY
- Time vs Counts
- Group Reference
- United group effort and training
- Do your homework

<https://theverticalworkshop.wordpress.com/2010/04/16/92/>

## MIXED LEVEL PROGRAMMING



### Level 1

- Low impact
- Lower intensity
- RPE 9 out of 10 for this individual
- Stepping motions
- Body resistance training
- Light weights for upper body movements
- Rest options
- Beginning option / injury modification



## MIXED LEVEL PROGRAMMING



### Level 2

- Basic fundamental movements
- Mid level impact
- RPE still at 9 out of 10
- Addition of heavier weights to movements
- Impact options available
- No real injuries or issues



## MIXED LEVEL PROGRAMMING



### Level 3

- High Intensity throughout
- Plyometric movements
- Heavy weights
- Quick transitions with little to no rest periods
- RPE 9 out of 10
- No injuries
- Complete body awareness
- Push past physical and mental barriers





## RPE CHART









# RPE CHART

The RPE Chart is the rate of perceived exertion



## FIT CHICKS "Rate of Perceived Exertion" CHART

PRE Perceived Rate of Exertion SCALE 1-10	% Max Heart Rate	How I'm Feeling		Description
1-4	< 50%		Aerobic, Endurance, Recovery	Barely working. Could do this all day!
5-6	55%			Just warming up or cooling down. Feeling a little hantay! You're breathing a little faster.
6.5-7	65%-70%		Aerobic	Breaking a sweat and breathing is getting faster (like a fast walk)
7.5	75%			Feels like work but you can sustain it
8	80%			Working hard! You can talk but it's getting tougher
8.5	85%			Sweating and working VERY hard but you can still push a little more
9	90%		Anaerobic	Really pushing chicks! Can only stay here 30 secs - 1 min (you can do it!).
9.5	95%			Breathing is very fast. Only stay here about 20 secs
10	100%			Max effort! This is your limit.

### Working at your 9 out of 10.

To get the benefits HR, you NEED to push yourself past the upper end of your aerobic zone and allow your body to replenish your anaerobic energy system during the recovery interval. At FIT CHICKS, we call this "Working at your 9 out of 10" to ensure our chicks are getting the max results from their high intensity interval to outcompete classes.

### How to measure your 9 out of 10?

Working to your "9 out of 10" is part of the "RATE OF PERCEIVED EXERTION" (or RPE). This 1-10 scale is an easy, amazing way for any chick to measure her exercise intensity without having to use any equipment (ie. a heart rate monitor).

## RPE CHART



How to use the chart with your clients:

1. Use this as a measurement tool to ensure they are working within the range that you are requiring and or requesting they are working at
2. Gauge which level clients should be working at
3. Explain to clients the levels at the start of every program so they are aware of what you mean when you use numbers as your tool to motivate them



## MODIFICATIONS

## MODIFICATIONS



Introduce modifications when required or requested.

These are different from your levels

They should be set up in advance with clients vs on the spot. (key to having that connection in your programming)



## MODIFICATIONS

### IMPORTANT

Offer alternative exercises for modifications that use same muscle group not just a simpler version of the movement.

Example:

Push up requires modification for someone with a wrist injury  
Offer chest press instead still same muscle group working with limited pressure to injury



## INJURIES

## INJURIES

Best way to help avoid injury with clients

- Review PARQ and Waivers
- Discuss during assessment
- Prepare in advance to accommodate
- Know your options
- Doctor clearance when required
- Have incident reports on hand



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## Disclaimer

\*This session is for your reference and awareness of various injuries and conditions that you may encounter as a Personal Trainer. Always remember, you are not a Regulated Health Care Professional and it is out of your Scope of Practice to diagnose any injury, disease, or condition. If you are ever unsure then always refer your client to a Health Care Professional.

Doctor, physio, chiro



## Disease and Injury: Definitions

### Pathophysiology

- Study of changes in body functions caused by disease

### Pathology

- Greek for disease
- Study of structural and functional changes in cells, tissues, and organs of the body.

### Disease

- Any deviation from or interruption of the normal structure or function of a part, organ, or system of the body



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## Disease and Injury: Definitions

When looking at the disease process, the following must be considered:

### Etiology

- Causes of disease

### Pathogenesis

- Refers to how the disease process develops and evolves

### Morphological Changes

- Hypertrophy, atrophy, hyperplasia, metaplasia, dysplasia,

### Clinical Manifestations

- Signs and Symptoms

### Diagnosis

- Identifying the disease or injury

### Clinical Course

- Evolution of a disease: acute, subacute, and chronic



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### Etiology:

- Biological Agents - bacteria, viruses
- Physical Forces - trauma (wound, injury), burns, radiation
- Chemical Agents - Poisons (alcohol, toxins)
- Nutritional excesses and deficits

### Pathogenesis

- sequence of cellular and tissue event that take place from time of initial contact with an etiologic agent until the ultimate expression of a disease
- Ex - muscle strain - straw that broke the camels back

### Morphological Changes

- hypertrophy - increase in cell size
- atrophy - decrease in cell size
- hyperplasia - increase in number of cells
- metaplasia - a reversible change in which one adult cell type is replaced by another adult cell type
- dysplasia - deranged cell growth that leads to changes in size, shape, and appearance. (all of the above = dysplasia)

### Clinical Manifestations:

- **Symptom:** Subjective complaint that is noted by person with a disorder
  - ex. Pain, difficulty breathing
- **Sign:** A manifestation that is noted by an observer
  - ex. Elevated temperature, a swollen extremity

Symptom = quantifiable by them

Sign = more quantifiable

ex. If you stab a bunch of people in the arm they will all quantify the pain differently but if all those people have a fever of 102 it's the same for everyone.

#### Clinical Course

- Acute – 1-3 days, up to 4 weeks (<1 mth)
- Subacute – 1-3 months
- Chronic – any condition, disorder, or disease that is on-going (>3 mths or longer)

## Basic Concepts of Disease

### Basic Concepts of Disease

- Cell adaptation
  - Cells have the ability to adapt when faced with stresses that endanger its normal structure and function; this adaptation assists cells to survive and maintain function
- Cell injury
  - Can occur in many ways; reversible up to a point
  - Duration and intensity will determine if a cell will be injured or will die
- Mechanism of cells injury
  - Free radical injury
  - Hypoxia
- Cell death
  - Two types:
    - i. Apoptosis - controlled (programmed) cell death
    - ii. Necrosis - a pathologic form of cell death resulting from cell injury



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Maintain Homeostasis – state of steady equilibrium, goal is to maintain relatively constant conditions in the body ie. Body temp

Cell adaptation - there are limits, if too much stress = injury or death

- a cell can return to its pre-adaptive state once signal for adaption is removed
- can be normal or abnormal depending on whether the stimulus was appropriate or inappropriate.
- adaptations include morphological changes

Cell injury - due to etiological agents

Mechanism of cell injury

- free radical - highly reactive chemical species that can lead to cell injury by reacting with key cellular components or setting off chain reactions leading to widespread damage.
  - Free radicals = bad
- hypoxia = lack of Oxygen, this interrupts ATP production (ATP needed for everything)
  - can be due to inadequate  $O_2$  in the air (high altitudes), respiratory disease, ischemia (decreased BF to an organ)

Cell Death

- apoptosis - ex - separation of webbed fingers and toes, removal of white blood

- cells after an inflammatory response
- necrosis - characterized by cell swelling, rupture of the cell membrane, and inflammation

## Inflammation

**Inflammation is the body's response to tissue injury caused by pressure, friction, repeated load or overload, and external trauma.**

- The following combinations can lead to inflammation:
  - Normal load at high frequency
  - Heavy load at normal frequency
  - Heavy load at high frequency
- Part of the body's second line of defense
- Brought on by various agents
  - Physical - trauma, ischemia, temperature extremes
  - Chemical - strong acid & bases, venom
  - Biological - bacteria, fungi etc.
- Suffix ``itis`` is used to indicate inflammation in a certain tissue (eg. tendinitis)



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Can also produce devastating effects - rheumatoid arthritis (destroys healthy tissues)

## Inflammation

The Inflammatory response can follow two patterns:

1. Acute (self-limiting)
2. Chronic (self-perpetuating)

Acute inflammation shows characteristic signs and symptoms that are produced by **vascular** and **cellular** chemical mediators

- Starts immediately
- Swelling caused by accumulation of fluid
- Redness caused by increased blood flow
- Local rise of temperature, caused by blood flow around the injured area
- Tenderness on touching the affected area
- Impaired function of the affected part because of swelling and tenderness

### Chronic Inflammation

- Lasts for weeks, months, or years
- Can develop as a result of recurring or progressive acute inflammatory responses or from low-grade responses that fail to evoke an acute response



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Can also produce devastating effects - rheumatoid arthritis

Vascular = swelling and redness

Cellular = happening at the cell level - we won't get into detail. It's a long and complicated process

**\*Pain should be interpreted as a warning sign of tissue injury and should lead to a rest from activity**

**There is good pain and bad pain**

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ. (pg. 42)

## Inflammation

### Tissue repair and wound healing

- Inflammatory response begins at time of injury
- Reconstructive phase begins within 3-4 days and may last up to 2 weeks
- Maturation phase begins 2 weeks after injury and can continue for 6 months or longer, depending on the extent of injury

### Most wounds/injuries do not regain full tensile strength of the original tissue

- ~ 2/3 of eventual maximum strength is achieved 2 to 3 weeks into the maturation phase
- Maximum strength achieved is ~ 80% of original strength

### Factors that affect wound healing

- Malnutrition
- Blood flow and oxygen delivery
- Impaired inflammatory and immune response
- Infection
- Wound separation
- Foreign bodies (ie. Bacteria)
- Age



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Malnutrition – body requires nutrients to heal


Can also produce devastating effects - rheumatoid arthritis

Vascular = swelling and redness

Cellular = happening at the cell level - we won't get into detail. It's a long and complicated process

This decrease in strength happens at the fiber level, the muscle as a whole may be stronger than pre-injury but the injured fibers themselves never will be 100% again





## Musculo-Skeletal Injuries: Sprains vs Strains

### Sprains

- The stretching or tearing of a ligament
- Partial tear – involves only part of the ligament fibers, DOES NOT affect joint stability
- Complete tear – involves most, or all, of the ligament fibers, DOES affect joint stability
- Most common in the ankle, knee, elbow, wrist, and shoulder

### Signs and symptoms

- Bleeding, bruising, swelling, tenderness, pain with movement, instability (depending on extent of tear)

### Rehab time

- Healing the ligament can take usually 6 weeks or longer
- May require taping, bracing

### Training Considerations

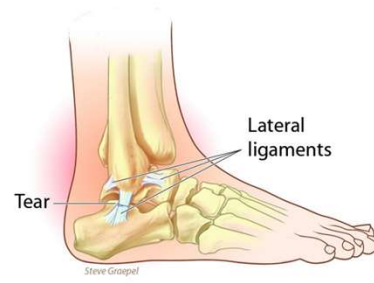
- Active muscular exercise and mobility training
- Key to protect the ligament from further damage

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ. (Pg 24)

Be careful with:  
Plyometrics and quick movements

Try to:  
Strengthen mm's around the joint  
Balance and stability work

## Musculo-Skeletal Injuries: Sprain



Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ. (Pg 24)

[https://en.wikipedia.org/wiki/Sprain#/media/File:Sprained\\_foot.jpg](https://en.wikipedia.org/wiki/Sprain#/media/File:Sprained_foot.jpg)

<https://gearjunkie.com/how-to-prevent-treat-sprained-ankle>




## Musculo-Skeletal Injuries: Sprains vs Strains

### Strains

- The stretching or tearing of a muscle or tendon
- First degree or mild strain
  - Overstretching of the muscle, no great loss of strength or restriction of movement
  - Active movement or passive stretching will cause pain around the area of damage
- Second degree or moderate strain
  - More significant but less than a total tear to the muscle
  - Pain when attempting to contract the muscle
- Third degree or severe strain
  - Total disruption of the muscle
- Most common in lower body, hamstrings, quadriceps, groin, calves

[https://physiocanhelp.ca/symptoms-conditions/sprains-strains/?gclid=Cj0KCQjwnKHIiBRDLARIsAMtMHDG-jz\\_8g206ths9-ZEK\\_DekS6he5NABTKMGURmUDR-k3Xst1c8SxQ8aAqo2EALw\\_wcB](https://physiocanhelp.ca/symptoms-conditions/sprains-strains/?gclid=Cj0KCQjwnKHIiBRDLARIsAMtMHDG-jz_8g206ths9-ZEK_DekS6he5NABTKMGURmUDR-k3Xst1c8SxQ8aAqo2EALw_wcB)  
Pg.30



## Musculo-Skeletal Injuries: Sprains vs Strains

**Strains continued...**

**Signs and Symptoms**

- Sharp stabbing pain at the moment of injury
- Pain can inhibit muscle contraction (total ruptures = no contraction)
- In partial ruptures – feel a defect in the muscle
- In total rupture – feel defect across muscle belly, muscle may “bunch up”
- Bruising and discoloration may occur
- Spams may occur

**Rehab Time**

- Healing depends on the extent of the tear, muscle fiber has a high capacity for regeneration but fibers will be shorter and have inelastic scar tissue

**Training Considerations**

- Gradual return to activity with a lower volume and load
- Work within your clients comfort levels
- Avoid aggressive stretching

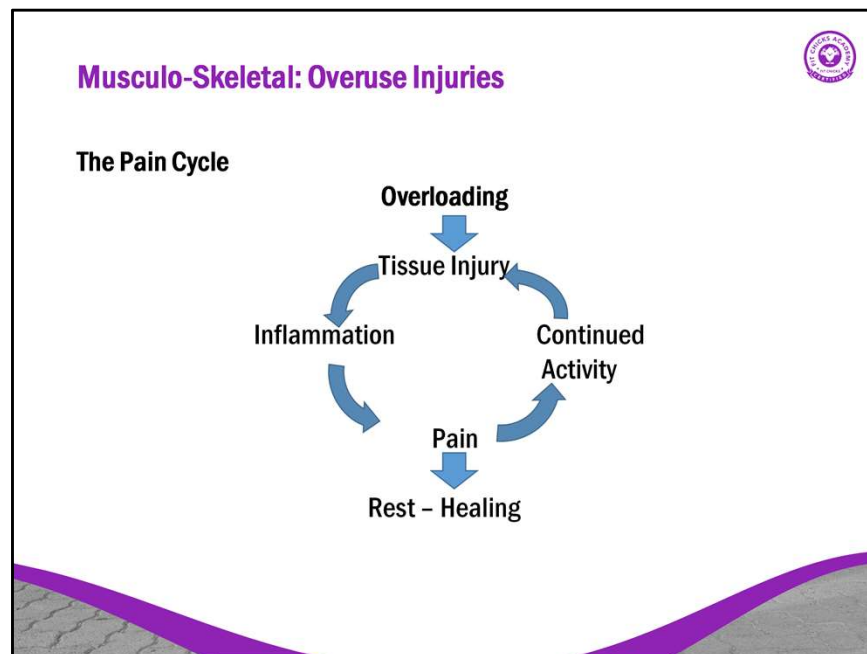
[https://physiocanhelp.ca/symptoms-conditions/sprains-strains/?gclid=Cj0KCQjwnKHlBRDLARIsAMtMHDG-jz\\_8g206ths9-ZEK\\_DekS6he5NABTKMGUrmUDR-k3Xst1c8SxQ8aAqo2EALw\\_wcB](https://physiocanhelp.ca/symptoms-conditions/sprains-strains/?gclid=Cj0KCQjwnKHlBRDLARIsAMtMHDG-jz_8g206ths9-ZEK_DekS6he5NABTKMGUrmUDR-k3Xst1c8SxQ8aAqo2EALw_wcB)

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.(Pg.30)

Soft tissue work to break up scar tissue



<https://www.brisbanechiropractor.com.au/blog/what-is-a-muscle-strain-or-tear/>  
<https://www.strengthminded.com/can-you-pull-a-muscle-without-knowing-it/>



The pain cycle

Common with overuse injuries

Age of occurrence


- Top level athletes = 20-29
- Non competitive athletes = 30-49

Sports involved = endurance sports ie. Long distance running, individual one-man sports like tennis, gymnastics, weight-lifting

Prevention of overuse injuries

- Thorough warm-up before and cool down afterwards
- Varied training, try to avoid repetitive, one-sided movements
- Gradual adaptation to new conditions – Going from running on a treadmill to outside
- Equipment adjusted to the environment
- Good basic training and general conditioning – make sure the basic movement patterns are there – adequate mobility, flexibility, strength and cardio

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.(pg45)



## Musculo-Skeletal: Overuse Injuries

**Tendinitis**

- Inflammation of the tendon
- Most common in the Achilles, long head of the biceps, supraspinatus tendon, extensor tendons of the wrist and ankle

**Signs and Symptoms**


- Acute phase – pain and occasionally crepitus during and after exercise
- Chronic phase – initial pain will often disappear during warm-up
- Impaired function and swelling

**Rehab**

- Acute phase – cold
- Active rest until the pain resolves
- Heat or contrast after initial acute phase is over

**Training Consideration**

- Isometric without load initially
- Eccentric exercises and light stretching
- Gradual return to activity



Tendinitis can be very difficult to treat and without rest can lead to chronic tendinitis and even tendinosis

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.

Crepitus = creaking sound

Focus it to return to pain free movement

## Musculo-Skeletal: Overuse Injuries



### Frictional Bursitis

- Inflammation of the bursa caused by a tendon moving repeatedly over a bursa
- Most common in the shoulder, elbow, hip, knee, and heel

### Signs and Symptoms

- Irritation stimulates inflammation which causes fluid to be secreted into the bursa which results in swelling and tenderness
- Overlying skin can be red and hot

### Rehab

- RICE – Rest, Ice, Compress, Elevate

### Training Consideration

- Gradual return to activity
- Avoid movements initially that create repetitive friction on the bursa


Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.(Pg47-48)

Bursitis can be extremely painful

Bursa – fluid filled sac around synovial joints, cushions, decreases friction between bone and soft tissue

Focus on low volume work starting back after injury, avoid creating excess friction along the bursa





## Musculo-Skeletal: Overuse Injuries

**Plantar Fasciitis (Tenoperiostitis)**

- Inflammation and pain at the attachment site of the plantar fascia into the calcaneus

**Signs and Symptoms**


- Pain at the attaching site
- Swelling and impaired function
- Pain is common after rest and with first few steps in the morning

**Rehab**

- Rest and Ice
- Can use heat after acute phase
- Soft tissue work on plantar fascia and calves

**Training Consideration**

- Avoid plyometrics, they can exacerbate the condition
- Thorough warm-up before any activity and stretching calves and plantar fascia
- Foot strengthening and balance




Tenoperiostitis is also common in the forearm – golfer’s elbow and tennis elbow (don’t need to be a golfer or tennis player to get either!)

Plantar fasciitis can be very hard to treat and can linger for a long time. Home care is crucial. Rolling and stretching the feet and calves before taking first few steps after sitting or sleeping. Foot strengthening and balance are also very important.

Avoid aggravating activities

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.



## Musculo-Skeletal: Overuse Injuries

### ITB Syndrome (Runner's Knee)

- Pain located along the lateral side of the knee joint over the epicondyle of the femur where the ITB slides across during flexion and extension of the knee. This repetitive movement causes local inflammation
- Affects long distance runners with excessive pronation of their feet or runners who run on cambered roads

### Signs and Symptoms


- Pain starts after a certain distance and becomes impossible to continue
- Local tenderness

### Rehab

- Rest actively and ice during the acute phase
- Heat after acute phase
- Avoid running downhill or on cambered surfaces

### Training Considerations

- Strengthening the feet and hips
- Stretching the hips



Runners are notorious for neglecting strength training and stretching. Both are very important in preventing runner's knee

Some ppl refer to patellar-femoral as runner's knee

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.


## Musculo-Skeletal: Overuse Injuries



### ITB Syndrome (Runner's Knee)



[https://www.hss.edu/condition-list\\_iliotibial-band-syndrome.asp](https://www.hss.edu/condition-list_iliotibial-band-syndrome.asp)



## Musculo-Skeletal: Overuse Injuries

### Patellar-Femoral Pain

- Local inflammation of tendon and muscle attachments around the patella
- Caused by overuse

### Signs and Symptoms

- Pain in the knee during and after exercise
- Stiffness the day after a training period or competition
- Local tenderness in the tendon or muscle attachment

### Rehab


- Rest actively, can take up to a few weeks for symptoms to subside
- Apply local heat after acute phase

### Training Considerations

- Gradual return to activity
- Proper warm-up and cool-down
- Strengthening the hips and feet

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ. Pg 307

Usually with knee pain it's either the feet, hips or both that are weak  
Foam roll the quads



## Musculo-Skeletal: Overuse Injuries

### Muscle Cramps and Spasms

- Can occur during or after strenuous exertion (spasms can occur anytime)
- Caused by
  - Prolonged exercise in hot conditions where lots of fluid can be lost,
  - Changes in musculature ie. Small muscle ruptures, muscular bleeding, poor general health and/or conditioning
  - Electrolyte imbalances

### Signs and Symptoms

- A tight/achy feeling in the muscle during a cramp and a sudden contraction/tightening in the muscle during a spasm. Both can be painful

### Rehab

- At the time of the cramp make sure fluid intake is adequate and clothing isn't too restrictive
- For a spasm, try to release the spasm by applying pressure and stretching

### Training Considerations

- Adequate warm-up and fluid intake during training sessions

Dehydration predisposes to muscle cramp

Precise cause of cramps is still argued – but any factors that impair circulation should be considered

Some people get random muscle spasms in the middle of the night

Adjust training session based on conditions, especially if training outdoors

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ. Pg 61


## Musculo-Skeletal: Overuse Injuries



### Muscle Cramps and Spasms



<https://i.ytimg.com/vi/PxnhDq3e-EU/maxresdefault.jpg>



## Musculo-Skeletal: Fractures

**Types of Fractures**

- Classified as transverse, oblique, spiral, comminuted, impacted, or greenstick
- If the bone pierces the skin it is known as an open or compound fracture
- When the skin remains undamaged it is known as a closed or simple fracture
- An avulsion fracture is when the bone attached to a muscle or ligament has been torn away

**Signs and Symptoms**

- Swelling and progressive bruising
- Tenderness and pain with movement and loading
- Deformity and abnormal mobility

**Rehab**

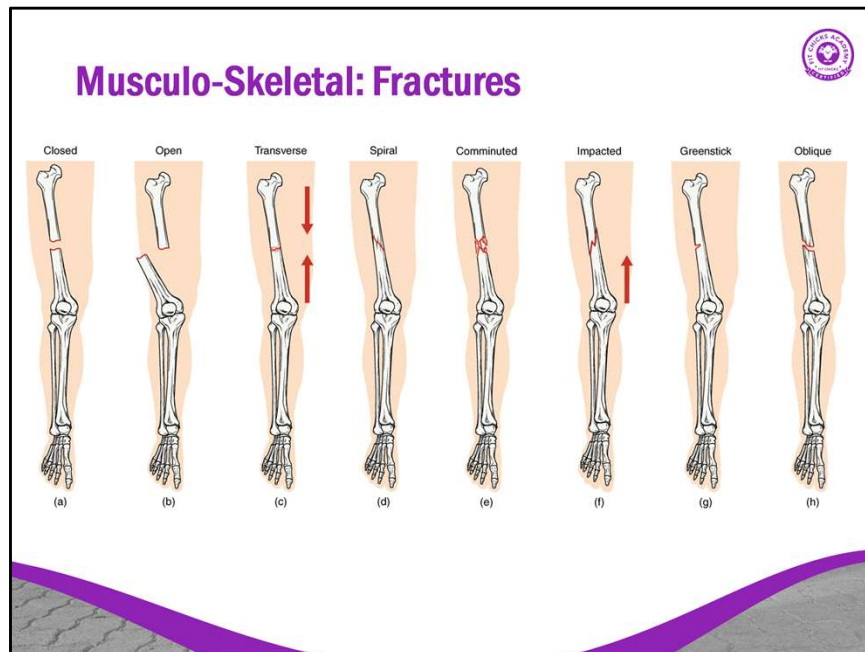
- Immobilization in a cast for 4-6 weeks, can be up to 3 months
- Isometric muscular contraction to the muscles inside the cast

**Training Considerations**

- Gradual return to activity
- Focus on muscle imbalances, proprioception, and regaining strength

By the time the time you start working with the client the cast will be off and they will have started rehab with physio. Training will be for muscle imbalances and regaining strength of the atrophied muscles



Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.



[https://s3-us-west-2.amazonaws.com/courses-images/wp-content/uploads/sites/1512/2017/03/31204409/612\\_Types\\_of\\_Fracturesabc.jpg](https://s3-us-west-2.amazonaws.com/courses-images/wp-content/uploads/sites/1512/2017/03/31204409/612_Types_of_Fracturesabc.jpg)

Transverse – a fracture that is at a right angle to the long bones axis  
 Spiral – a fracture where at least one part of the bone has been twisted  
 Comminuted – bone has broken into several pieces  
 Impacted when bone fragments are driven into each other  
 Greenstick – soft bone frays like a branch when bent (only in children)  
 Oblique – a fracture that is diagonal to the bones long axis





## Musculo-Skeletal: Osteoarthritis

### Osteoarthritis (“Worn Joints”)

- The degeneration and excessive wear of articular cartilages (gradual changes in underlying bone tissue also occur)
- Cartilage softens, surface become uneven, the cartilage ‘frays’ and develops cracks, the cartilage is eventually worn away to reveal bone

### Signs and Symptoms

- Pain – can vary greatly with each person and situation
- Joint abnormalities
- Morning stiffness or after rest

### Rehab

- Reduce load, active mobility and muscular strengthening

### Training Considerations

- Proper warm-up and cool-down
- Work within your clients pain tolerance, movement is key
- Avoid high impact activities

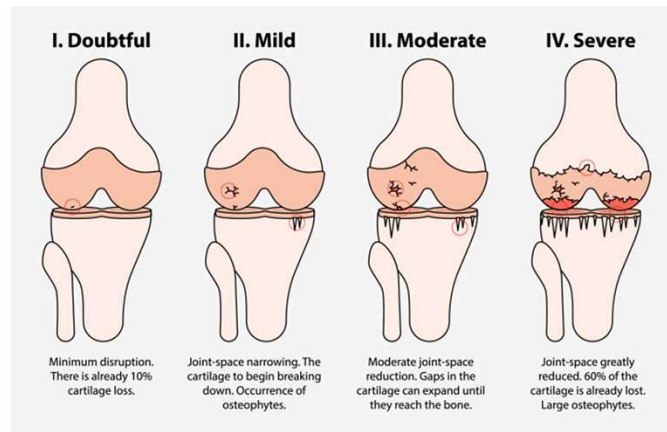
Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.(Pg 49-50)

Irreversible


Pain – may go away with warm-up, may get worse, may be present during daily activities, may not.

Movement is key with arthritis, even though it’s painful, it’s important to keep the joint moving and lubricated. For lower extremity joint, weight management is key to avoid excessive load

## Musculo-Skeletal: Osteoarthritis



<https://www.pthealth.ca/conditions/osteoarthritis/>



## Musculo-Skeletal: Osteoporosis

**Osteoporosis**

- Pathological condition where bones are extremely fragile and soft
- Bone become more 'porous' and more likely to fracture
- Fractures are most commonly seen in the hips, spine, and wrist

**Signs and Symptoms**

- Chronic back pain
- Loss of height with time
- Stooped posture
- Frequent fractures of bones

**Rehab**

- Rehab post fractures

**Training Considerations**

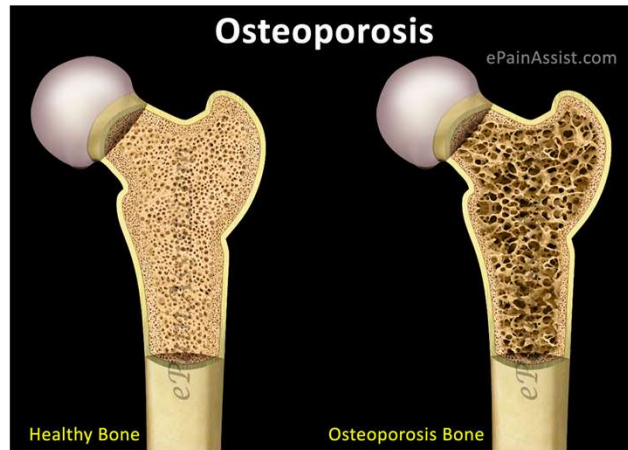
- Weight bearing exercises are important to maintain bone strength
- Balance to help prevent falls
- General muscle strengthening and conditioning

<https://www.epainassist.com/bones/osteoporosis>


Avoid back squats – no adding weight to spine

Continuing weight bearing activities will slow down the progression of OP

## Musculo-Skeletal: Osteoporosis



<https://www.epainassist.com/bones/osteoporosis>



## Musculo-Skeletal: Spine, Back, and Core

**Disc Injuries**

- Disc bulge – the nucleus leaks fluid out through the damaged layers of the annulus fibrosus causing a bulge or protrusion
- Disc herniation – the very outer layer of the disc (annulus fibrosus) has been broken and fluid (nucleus pulposus) is leaking out

**Signs and Symptoms**


- KEY – not everyone with low back pain will have a disc issue and not everyone with a disc issue will have low back pain
- Pain can radiate down the leg and cause sciatic pain

**Rehab**

- Can vary from individual to individual
- Usually involve extension exercises like sloppy push-ups to ease the disc back in
- Avoid flexion type movements which can bulge or herniate the disc even further

**Training Considerations**

- Form is crucial, so is core strength
- Same principles as rehab



<https://www.brianellcott.com/wordpress/wp-content/uploads/2017/11/bulging-herniated-disc.jpg>

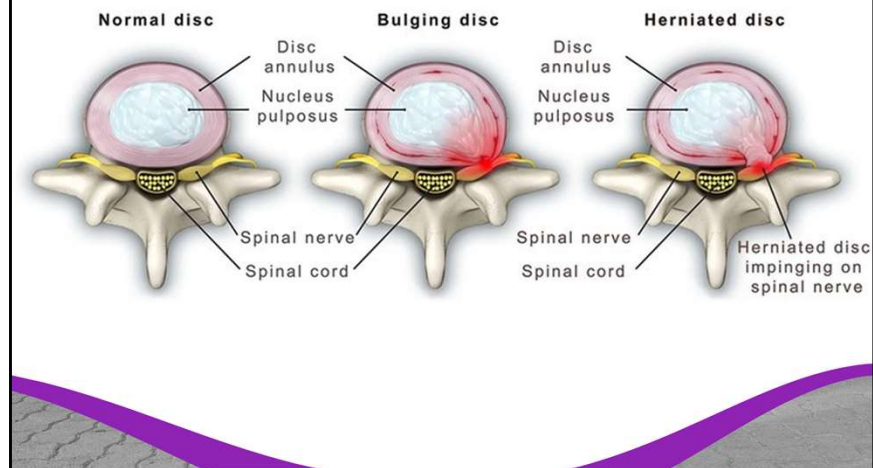
Jelly donut analogy

Nucleus pulposus = jelly


Annulus fibrosus = doughy exterior

Limit flexion, especially during acute phase

## Musculo-Skeletal: Spine, Back, and Core



<https://www.brianellcott.com/wordpress/wp-content/uploads/2017/11/bulging-herniated-disc.jpg>



## Musculo-Skeletal: Spine, Back, and Core

**Low back pain**

- A number of factors can contribute to LBP
  - Can be mechanical or structural, muscular or neurological

**Signs and Symptoms**

- Degree and type of pain can vary
- Pain be present at rest, with activity, or both

**Rehab**


- Depend of what's causing the LBP

**Training Considerations**

- Work within clients pain tolerance
- Posture and form is crucial
- Try to even out muscle imbalances
- Maintain adequate core strength

Structural pain can be difficult to work with, if there is osteophyte growth then strengthening won't decrease pain but can help prevent further pain

Stuart McGill – 3 exercises that can help with back pain – bird dog, side plank and glute bridge



## Musculo-Skeletal: Spine, Back, and Core

### Piriformis vs Sciatica

- Piriformis Syndrome – also known as pseudo-sciatica is when the piriformis muscle irritates the sciatic nerve sending pain, tingling, and numbness down the leg
- Sciatica – also known as lumbar radiculopathy is pain, tingling, numbness felt along the sciatic nerve. True sciatica is when the nerve is compromised in the lumbar spine

### Signs and Symptoms


- Pain, tingling, numbness going down the leg
- Sciatica can have pain down any part of the leg where as piriformis syndrome will only radiate down the posterior leg

### Rehab

- Will vary depending on which condition it is

### Training Considerations

- Soft tissue work – foam rolling glutes will help release the piriformis muscle
- Stretching the glutes, especially the piriformis
- Evening out muscle imbalances
- Core and hip strengthening



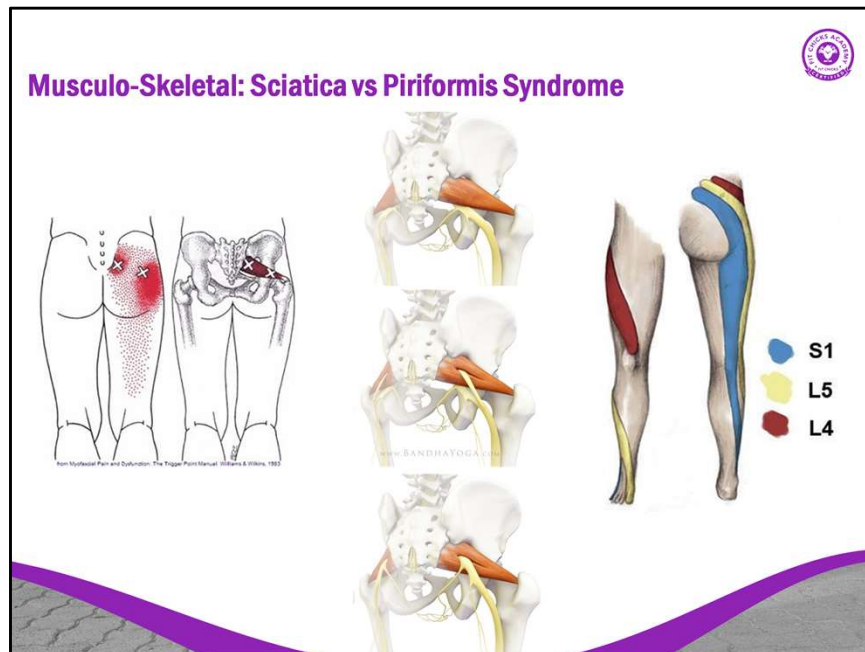
<https://www.spine-health.com/blog/piriformis-syndrome-same-thing-sciatica>

A piriformis trigger point can also mimic sciatic pain


Avoid movements that trigger sciatic pain – work with your client to figure out what irritates them and what does not

True sciatica can be difficult bc it could be a result of bony growths/osteophytes





<http://themassageclinic.ca/blog/sciatica-versus-piriformis-syndromeoakville/>  
<https://hackingwithcare.in/2014/08/piriformis-syndrome-sciatica-pain-relief-with-yoga/>  
<http://www.mkphysio.co.za/wp-content/uploads/2014/01/pain-referral-2.jpg>



## Musculo-Skeletal: Joint Injuries

### Meniscal Tears

- Shear stress on the meniscus can cause flaking of the tissues where the tissue strength is exceeded
- This shear stress is caused by forceful twisting or hyperflexion of the knee

### Signs and Symptoms


- Pain, swelling, popping, giving away

### Rehab

- May require surgery depending on the extent of the tear
- Ice in acute phase
- Active rest

### Training Considerations

- Gradual return to activity
- Strengthen muscles around the knee, hip
- Avoid jumping, twisting exercises, quick changes of direction



Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.(Pg 83)

Meniscus absorb shock, helps femur articulate on the tibia

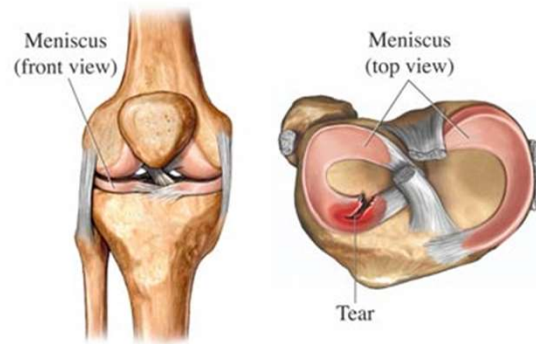
May need a brace, may need surgery depending on extent of tear

Deep squats and lunges may be painful and may need to be avoided during acute phase

## Musculo-Skeletal: Joint Injuries




### Meniscal Tear



<http://www.getactivephysio.com.au/wp-content/uploads/2013/09/Meniscus-Tear.jpg>

The meniscus is a figure 8 shaped piece of cartilage that sits on top of the tibia, it helps the femur to articulate with the tibia and acts as a shock absorber



## Musculo-Skeletal: Joint Injuries

**Dislocations**

- Total dislocation (luxation) – the opposing articular surfaces have become separated and are no longer in contact with each other
  - Most common in the shoulder, elbow, finger joints, and patella
- Partial dislocation (subluxation) – the articular surfaces remain in partial contact with each other but are no longer correctly aligned.
  - Most common in the knee, ankle, and acromioclavicular joint
- For a dislocation to occur, part of the joint capsule and its ligament are torn

**Signs and Symptoms**

- Visual and palpable deformity
- Pain, swelling, tenderness

**Rehab**

- Focus is on restoring stability and function
- Immobilization if needed – can last 1-6 weeks

**Training Considerations**

- Strengthen the muscles around the joint to improve joint stability

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.(Pg. 25)

Dislocations can be further complicated if nerves and blood vessels are damaged – never reduce a joint by yourself. Go see a Dr.

With a shoulder dislocation, be careful with overhead movements

## Musculo-Skeletal: Joint Injuries: Dislocations



<https://lifeinthefastlane.com/wp-content/uploads/2010/01/posterior1.jpg>  
<http://blog.clinicalmonster.com/2016/05/12/shoulder-dislocations-austere-environments-novel-approach/>  
<https://coreem.net/core/true-knee-patellar-dislocations/>

## Musculo-Skeletal: Joint Injuries

- Trapping of soft tissues leading to painful inflammation
- Most common in the shoulder as a result of repetitive movements of the arms in or above the horizontal plane. ie. Swimmers, tennis players, throwers, weight lifters
- The space between the head of the humerus, the vault formed by the acromion process of the scapula and the coraco-acromial ligament is small and can be restricted further if the ligament is thickened or calcified
- When the humerus is moved forwards and upwards (usual position) to 90° and then rotated inwards, the soft tissues are compressed against the sharp edge of the coraco-acromial ligament. This repetitive movement can irritate the tendons and the bursa causing painful inflammation

**Signs and Symptoms**

- Pain around 90° with forward and inward movements
- Tenderness around the lateral head of the humerus
- Impaired mobility
- If conditions becomes chronic, pain could become nagging and present at rest

Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.(Pg 192)

With inflammation the space gets smaller and the condition becomes progressively worse.

Seated posture at a computer – kyphotic upper back, anteriorly rotated/forward shoulders = perfect storm for impingement

## Musculo-Skeletal: Joint Injuries

### Shoulder impingement continued...



Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.(Pg 192-193)  
<https://physioworks.com.au/injuries-conditions-1/rotator-cuff-impingement>

## Musculo-Skeletal: Joint Injuries



### Shoulder impingement continued...

#### Rehab

- Active shoulder joint movements with proper scapular movement patterns
- Continue with conditioning exercises
- Resume sports gradually when pain is resolved

#### Training Considerations

- Proper warm-up and flexibility program to prevent condition from occurring and recurring
- Strength training with proper form
- Adequate shoulder mobility and stability



Peterson, L., & Renström, P. (1986). *Sports injuries their prevention and treatment*. Chicago: Year Book Medical Publ.(Pg 192-193)

<https://physioworks.com.au/injuries-conditions-1/rotator-cuff-impingement>

When acute, avoid overhead movements (flexion, abd above 90 degrees). This isn't forever, before returning to overhead movements, focus on proper scapular movement, shoulder stability, thoracic mobility



## Cardio-Respiratory Conditions




### High Blood pressure vs Low blood pressure

- Review: Blood pressure is the pressure the blood in the blood vessels
- Systolic pressure (top number) is the pressure of the blood in the vessels when the heart beats
- Diastolic pressure (bottom number) is the pressure of the bloods in the vessels when the heart relaxes
- High blood pressure - 140/90 mmHg
- Prehypertension - Between 120-139 mmHg systolic and/or 80-89mmHg diastolic
- Low blood pressure - less than 120/80 mmHg

### Training Considerations

- Make sure your client is cleared for exercise and being monitored by their Doctor
- Gradual exercise progression is extremely important to not stress the cardiovascular system beyond its abilities
- A client with low blood pressure may experience dizziness with exercises involving getting up and down off the ground



## Cardio-Respiratory Conditions

### Heart Conditions

- Common conditions include:
  - Coronary artery disease – atherosclerosis of coronary arteries
  - Angina – decreased blood flow to the heart
  - Cardiac arrhythmias – alterations in the cardiac rate or rhythm

### Training Considerations

- Medically cleared by their Doctor to perform an exercise program and ask if there are any restrictions (Par-medx)
- Most clients with heart conditions will be monitored by their Doctor
- You can always refer to another trainer or professional if you are unsure about working with a client and their condition
- Follow your training principles, gradual exercise progression

Atherosclerosis – hardening of blood vessel wall

Main conditions you will see. Any other cardiac conditions will move than likely be too far progressed and that person will be working with a cardiac specialist doing a rehab program.

With heart conditions, start slowly, it's better to go too easy or two short than too hard initially.

Don't forget to ask client if they have meds and if they may need to take them during a training session. If so, know where the meds are.

## Cardio-Respiratory Conditions

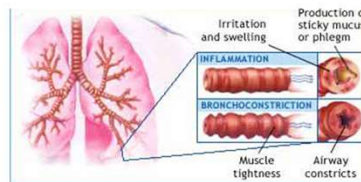


### Asthma

- Chronic inflammatory disease of the airway that causes shortness of breath, chest tightness, coughing, wheezing

### Training Considerations

- Make sure your client has clearance from their Doctor for physical activity
- Best options are those with short, intermittent bursts
  - Ex. Volleyball, baseball, gymnastics
- Endurance activities might prove challenging (swimming can be an exception, due to the warm, moist air)
- Cold weather cardio should be avoided
- Make sure your client brings their inhaler with them to all training sessions



<https://asthma.ca/what-is-asthma/>

## Other Conditions: Endocrine



### Diabetes Mellitus


- Means "siphon" "honey"
- Chronic disorder of carbohydrate, fat and protein metabolism
- A deficiency in the secretion of insulin impairs carbohydrate use and increases the catabolism of fats and proteins to meet the cells need for energy
- Type I - insulin dependent, onset before the age of 20, body does not produce enough insulin
- Type II - non-insulin depending, onset after the age of 30, insulin resistance occurs
- Gestational diabetes - happens during pregnancy, may reverse post-partum

### Training Considerations

- Make sure you client is cleared by their Doctor for a gradual exercise program
- Always have a juice box or something sweet just in case your client blood glucose drops too low

Most clients with diabetes are really good at monitoring their blood glucose levels, especially if they are looking to improve their health and hire a trainer

Hyperglycemia is a indication of diabetes



## Other Conditions: Endocrine

### Thyroid

- Body's major metabolic organ
- Secretes Thyroxine =  $T_4$  and Triiodothyronine =  $T_3$  – work at almost every cell in the body except the adult brain, spleen, testes, and uterus
  - Increase basal metabolic rate and body heat production
  - Promote breakdown of glucose by cells
  - Regulation of tissue growth and development
  - Promotes normal adult function of nervous, CV, and muscular systems

**Hyperthyroidism** – thyroid makes too much hormone  
**Hypothyroidism** – thyroid makes too little

### Training Considerations

- Make sure your clients obtain medical clearance for an exercise program
- Client will more than likely be medicated to control hormone levels

Breakdown of glucose by cells is what? Glycolysis

If clients are aware of their condition and being monitored by a doctor then they will most likely be medicated

Hyperthyroidism = hard time gaining weight

Hypothyroidism = hard time losing weight

## Other Conditions: Neurological



### Seizures

- Sudden, explosive, and disorderly electrical activity of neurons which produces transient changes in brain function
- Altered brain function may include motor, sensory, autonomic as well as changes in consciousness (altered brain function depends on area of brain affected by seizure)

### Epilepsy

- Condition of recurrent seizures that occurs without an identifiable cause (idiopathic) or that cannot be corrected (symptomatic)

### Signs and Symptoms

- Not all seizures are noticeable
- Signs can vary from no loss of consciousness to impaired consciousness, facial movements or grimaces, jerking movement of one part of the body, tingling, sensory experiences of smell or sounds, automatisms and mild twitching, sudden loss of muscle tone, localized brief involuntary muscle contractions (what most people think of)

### Training Considerations

- Discuss with your client the type of seizures they experience, the signs, and what you should do if they have a seizure while training
- Make sure they are being monitored by a Doctor and are cleared for activity

Sensory – for all the Canadians you probably remember the burning toast commercial (or I just dated myself!!)



## Other Conditions: Neurological

### Concussion

- Momentary interruption of brain function with or without loss of consciousness
- Microscopic changes are usually evident without hours of injury
- Recovery usually within 24 hours
- Different grades of concussion are described based on severity: grade I, II, III, and IV

### Signs and Symptoms

- Confusion, disorientation, and amnesia are possible
- Post-concussion syndrome (PCS) – headache, irritability, insomnia, poor concentration and memory that may persist for months

### Rehab

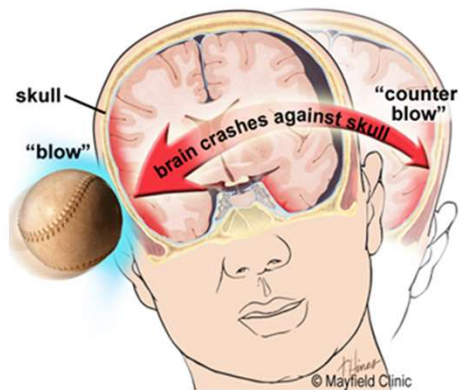
- Will vary depending the severity of the concussion and post-concussion symptoms
- May be working with a concussion specialist

### Training Considerations

- Clearance from their Doctor
- Gradual return to activity, work below the level of reproducing PCS symptoms unless directed otherwise by Doctor or concussion specialist

## Other Conditions: Neurological

### Concussion



<https://mayfieldclinic.com/pe-concussion.htm>

Not only do you get a "blow" where the initial contact was but there is also a counter blow on the opposite side of the skull



## Injury Prevention



### The best form of injury prevention is

- A proper warm-up
- Well rounded training program that includes cardio, strength, flexibility, mobility, and soft tissue work (foam rolling!!)
- A proper cool-down
- Gradual progressive exercise prescription
- Gradual progressive overload – follow your training principles



<https://blog.fitbit.com/6-foam-roller-moves-for-every-runner/>

While assessing look for muscular imbalances or lack of mobility/flexibility that can be addressed with a training program. This will help with injury prevention

## FITT for Cardio

### Frequency

- 3-5 x per week

### Intensity

- 50-85% of HR Max

### Time

- 20 – 45 mins

### Type

- LISS (50-75%) for cardiovascular endurance adaptations
- HIIT (75-90%) for fat loss and to train for certain sports



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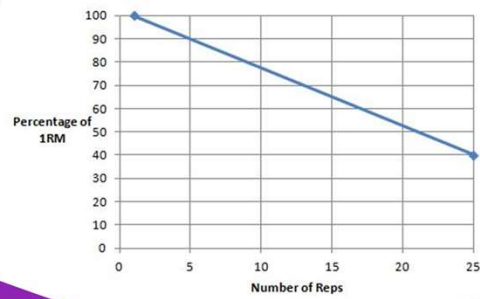
## FITT for Strength Training



### Frequency

- 2 to 4 days a week
- Rest is critical (most of the gains happen during your recovery day!)
- Approximately 48 hours needed before you train that body part again
- More rest is better than not enough rest!

### Intensity





## FITT for Strength Training Continued...

### Time

- Rest
  - Between 30 secs (beginner) - 2 mins (Power lifter)
- Tempo
  - 2:0:2:0 or more
  - The more time under tension, the harder it is

### Type

- Beginners
  - Free weights, Machines, Bodyweight, Bands, Resistance Balls
- Intermediate-Advance
  - Free weights, TRX, Kettlebells, etc

## FITT for Flexibility Training

### Frequency

- It's recommended that you perform flexibility training once a day for 3-7 days a week
- Ideally, flexibility training should be performed AFTER the workout, as the muscles are warm and most pliable

### Intensity

- Your flexibility program should feel like slight tension with NO PAIN. It should never hurt!

### Time

- Hold each stretch for a minimum of 30 seconds (or 6 deep breaths)

### Type

- Static stretching
- Mobility/Dynamic stretching
- It is recommended that everyone does flexibility training as part of their daily routine
- Athletes may choose to incorporate some mobility training prior to their workout.



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- <http://www.sportsscience.co/flexibility/how-often-and-how-long-should-i-stretch-to-improve-flexibility/>

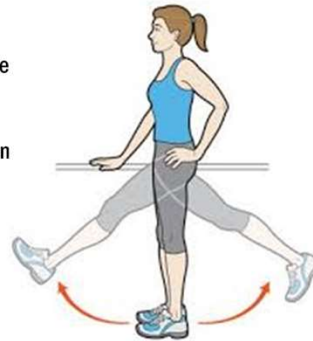
## What is Dynamic Stretching?



- Also known as “moving stretches”.
- Typically performed in a warm up to warm up the muscles and stretch them to prepare for the exercise ahead
- Reduce injuries
- Great to improve functional range of motion

### Examples include:

Arm circles  
Light jog  
Side to side lunges  
Hip circles  
90/90 rotations  
Squat to stand



## Dynamic Stretching

Dynamic stretching is also known as “moving stretches”. These stretches are typically performed in a warm up to warm up the muscles and stretch them to prepare for the exercise ahead and reduce injuries.

Dynamic stretches are also great in addition to doing in a warm up to help improve functional range of motion, mobility in sports and in performing everyday activities.

Dynamic stretching is similar to active stretching. However, in dynamic stretching you don't hold the stretch. You are always moving or dynamic

Note that dynamic stretching should not be confused with old-fashioned ballistic stretching (remember the bouncing toe touches from PE classes?). Dynamic stretching is controlled, smooth, and deliberate, whereas ballistic stretching is uncontrolled, erratic, and jerky. Although there are unique benefits to ballistic stretches, they should be done only under the supervision of a professional because, for most people, the risks of ballistic stretching far outweigh the benefits.

<http://www.humankinetics.com/excerpts/excerpts/types-of-stretches>

## Treatment



Most soft tissue injuries will follow the RICE protocol (rest, ice, compress, elevate) during the acute phase.

When unsure about an injury always refer to a Health Care Professional that can diagnose a condition. I.e. Doctor, physiotherapist, chiropractor

Don't be afraid to reach out to your clients Health Care Provider for more information. Always make sure your client gives permission to both parties to share information. (This may be written consent depending on where you live)

Work within your scope of practice, your comfort level and your clients

Your best resource is your peers!!!!

Subacute phase will vary depending on the extent of the injury

Treatment is usually a combination of

- Decreasing mm tension
- Increasing mm strength
- Decreasing mm imbalances
- Increasing mm flexibility



## Resources



- Instagram accounts to follow
  - @moveu\_official
  - @vinnierehab
  - @mobilitywod
  - @thefootcollective
  - @theprehabguys
  - @optimize.physiotherapy
  - @myodetox
  - @thegirlsgonestrong
  - @jamesmithpt (he's a little crude but if you can tolerate it, he does have really good advice)
- Becoming a Supple Leopard by Dr. Kelly Starrett
- Sports Injuries, Their Prevention and Treatment by Lars Peterson and Per Renstrom
- Stuart McGill
- <https://www.runnersworld.com/health-injuries/a20812623/how-to-use-a-foam-roller-0/>

## Recap



### **TEACHING A MIXED LEVEL GROUP:**

- How to offer level systems
- Positive Context

### **RPE CHART:**

- What it is and how to effectively use this tool with clients

### **MODIFICATIONS:**

- Setting clients up for success with injuries or specific requirements

### **INJURIES:**

- Setting clients up for success
- Common injuries and modification options

## Recap



**PATHOLOGY AND INJURY**

**MUSCULO-SKELETAL INJURIES**

**CARDIO-RESPIRATORY CONDITIONS**

**ENDOCRINE CONDITIONS**

**NEUROLOGICAL CONDITIONS**

**INJURY PREVENTION AND TREATMENT**

**RESOURCES**

**BEGIN ASSIGNMENT #1**



**Any questions or inquiries,  
please email:**

**[fne@fitchicks.ca](mailto:fne@fitchicks.ca)**