
The Mountaineers
Movement Analysis and Injury Prevention
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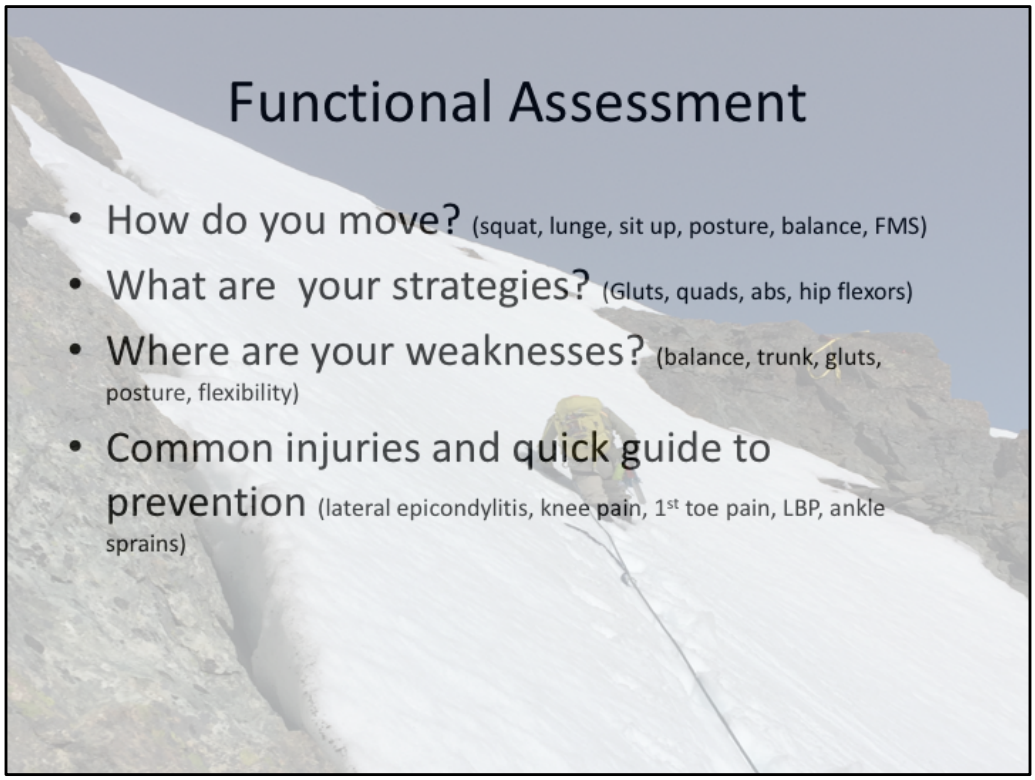
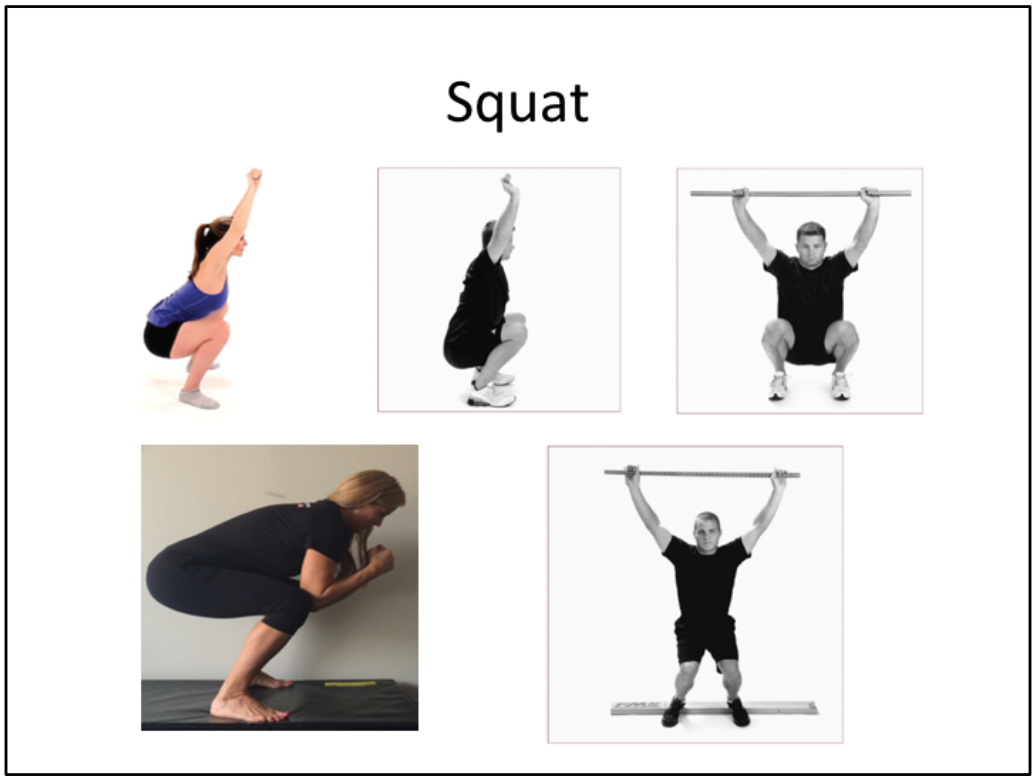
mti physical therapy
PROVIDING ONE-TO-ONE CARE


Functional Assessment
• How do you move? (squat, lunge, sit up, posture, balance, FMS)
• What are your strategies? (Gluts, quads, abs, hip flexors)
• Where are your weaknesses? (balance, trunk, gluts, posture, flexibility)
• Common injuries and quick guide to prevention (lateral epicondylitis, knee pain, 1st toe pain, LBP, ankle sprains)



The top row of pictures are consider “good” form in a squat.

The top row models have enough flexibility through their upper back, hips, and ankles as well as the strength in their gluts and quads to get their butt down below their knees while keeping their trunk in a more upright position. From the front view hips and knees are in line with his feet.

In the bottom picture the lady is unable to get her butt below her knees, so she has compensated by leaning her trunk forward closing the angle in the front of her hips. This lady could put her feet almost up against the wall and then squat. The wall would prevent her from leaning too far forward. She will find that she is not able to squat as deep as she thought she could. It is great external cue to help her keep her form as she trains.

The last picture on the bottom right, the man’s knees are buckling. Notice how his knees do not line up with his feet. This is often due to hip weakness.

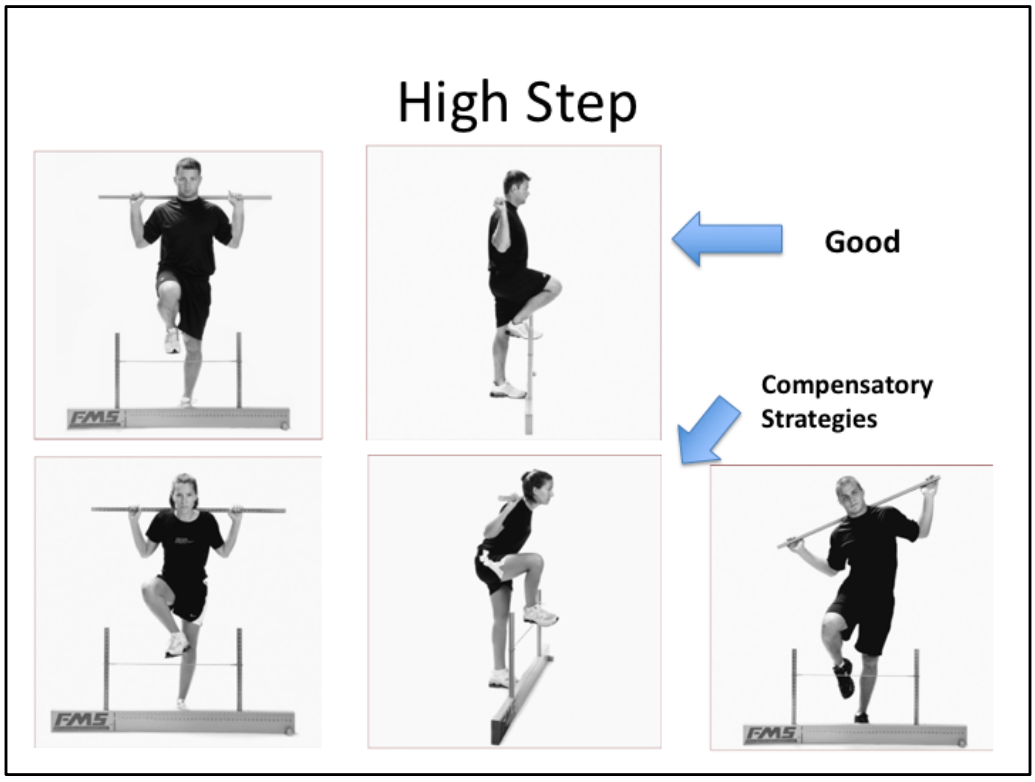
Remember: due to human biological variation we will not all perform a perfect textbook squat. This is not always bad, it may simply be different. If you continually find a pattern of weakness, lack of flexibility, find asymmetries left vs right, you consider working on your form.

Alignment helps prevent ligamentous injuries as well as other pain associated with knee pathology.

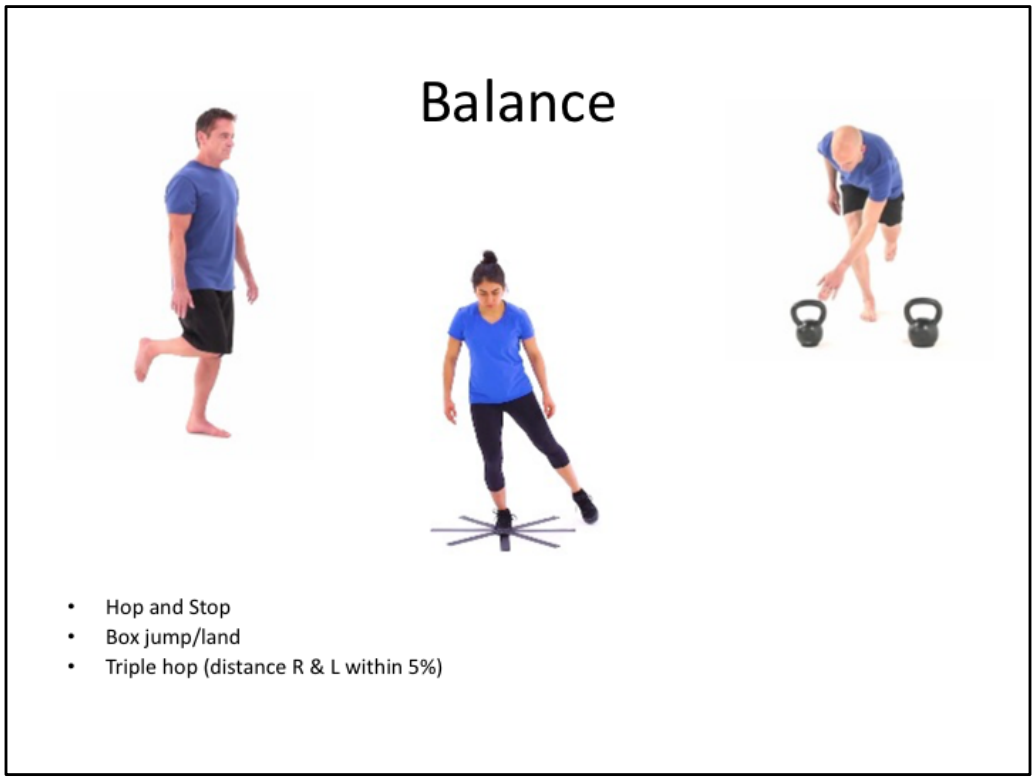
Lunges, step ups, and lowering from a step are all functional movements that can be used to screen your form and strength and as the training exercise.

The two side views on the top row demonstrate good form. During training, keep your tibia nearly vertical and the knee not going past the end of the toes and sit your butt back. This reduces compression on the knee joint. When doing reps for training follow these guidelines. Do not worry about “rules” when you go hiking, just have fun! Your training should ideally set you up for success on the trail.

The bottom pics are an example of poor control. Try single leg movements in front of a mirror and see how you look, compare left vs right, see how low you can go with good form.

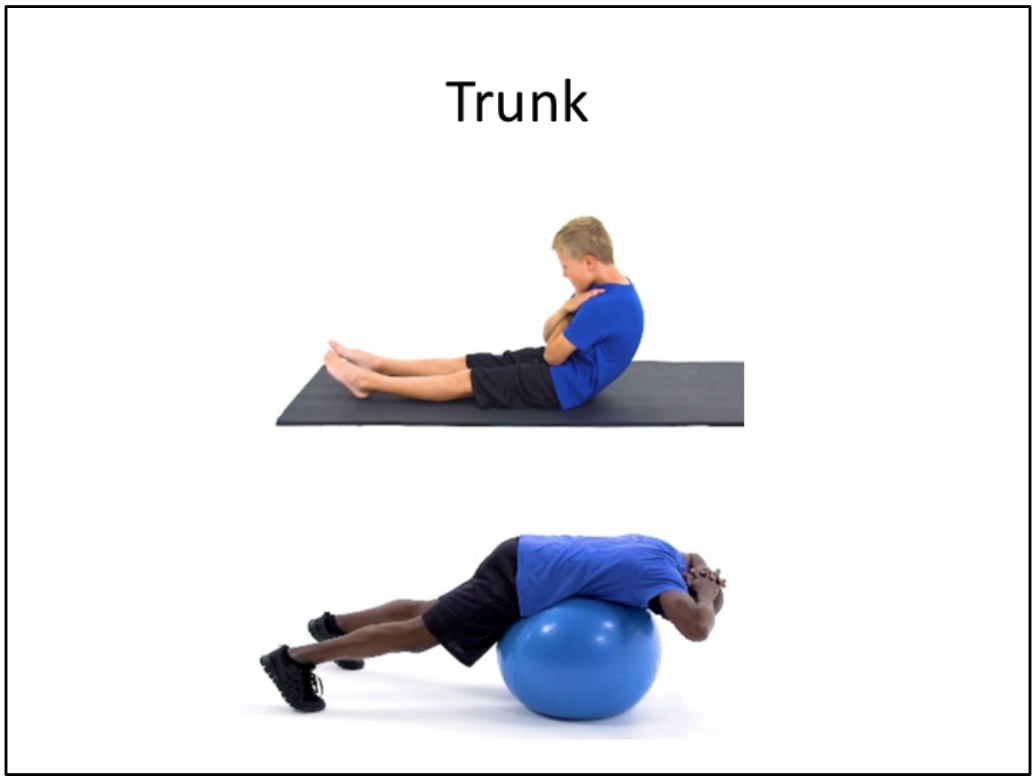


The top two pics are good form. The bottom 3 have compensations.
This is a screening movement that may capture compensations. It does not tell you if it is due to strength, flexibility, or where the disconnect resides. Try this out and see you find it is stiffness, balance, or simply weakness lifting the leg. Try it with a backpack on and see how that compares.



Balance progressions:
Single leg balance: try it when turning head side to side, this reduced visual feedback and causes you to rely more on the information your joints are sending back to your brain (proprioception), try balance with eyes closed
Balance and reach with lower extremity
Balance and reach with upper extremity

Then try these wearing a backpack and see how that changes your center of gravity and your movement control.



Curl up with Plantar flexion (toes pointing down) vs dorsiflexion (toe/ankles pulling up)

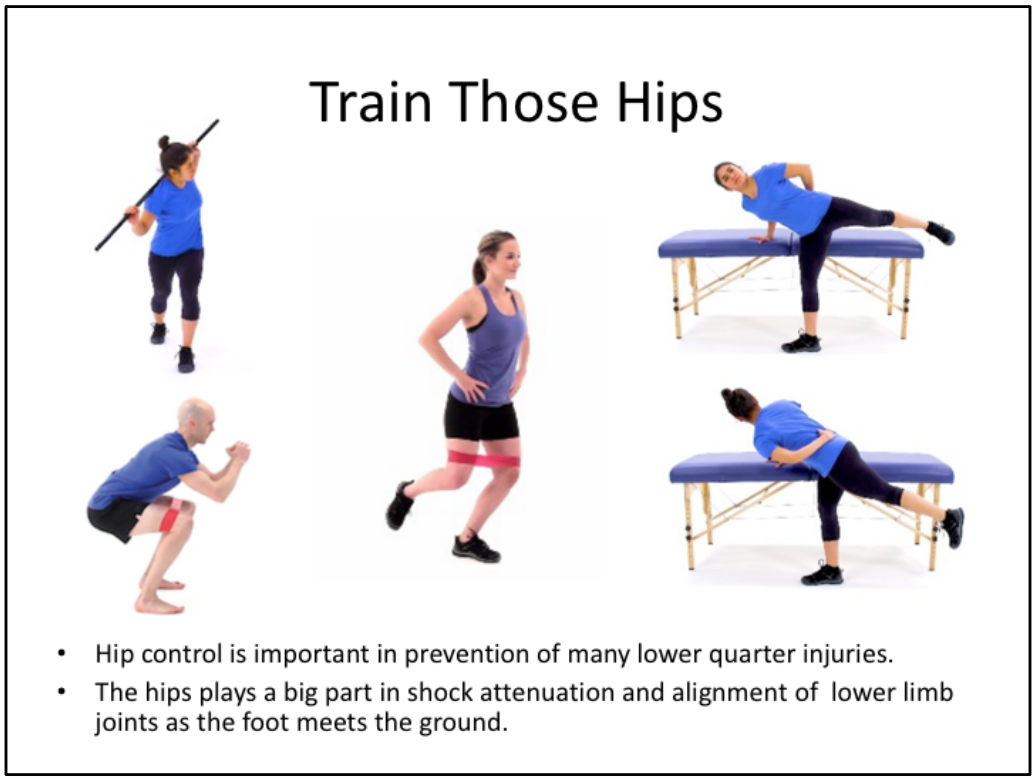
A) Do a sit up with your feet tucked under something or someone holding your feet so you can pull feet up as you curl up.
B) Then do the sit up pressing your feet down into the mat or pointing your toes down and flexing your calf as you curl up.

The second version reduces the recruitment of your hip flexor muscle and many folks find it much harder to curl up to a full sit.

If you want to increase the work load on the abs, do crunches with the feet pointing down and the calf muscle lightly activated.

Functional training is doing movements that are similar to motions that our body does during normal activity.
For example, the pictures on the right could be someone unloading the dishwasher. They lift the dish up into the upper cupboard and then bend back down to the dishwasher.
You get a lot of bang for your time when training using functional movements because it uses the entire body, requiring upper and lower quarter strength and coordination
There is nothing wrong with lying on a mat and doing crunches or doing squats the rack. Consider adding in some functional movements to your workout.

They can be an efficient way to train using upper extremity, lower extremity and the trunk all in one exercise and more closely reflect movements you will do out on the trail.



The hips are often found to be weak on many people.
Poor hip muscle activation can be driven from low back issues.
Research has even shown the post ankle injury (like a sprain) people have a weaker hip on the side of the injury.

Hip weakness can be a culprit in many lower extremity musculoskeletal issues.

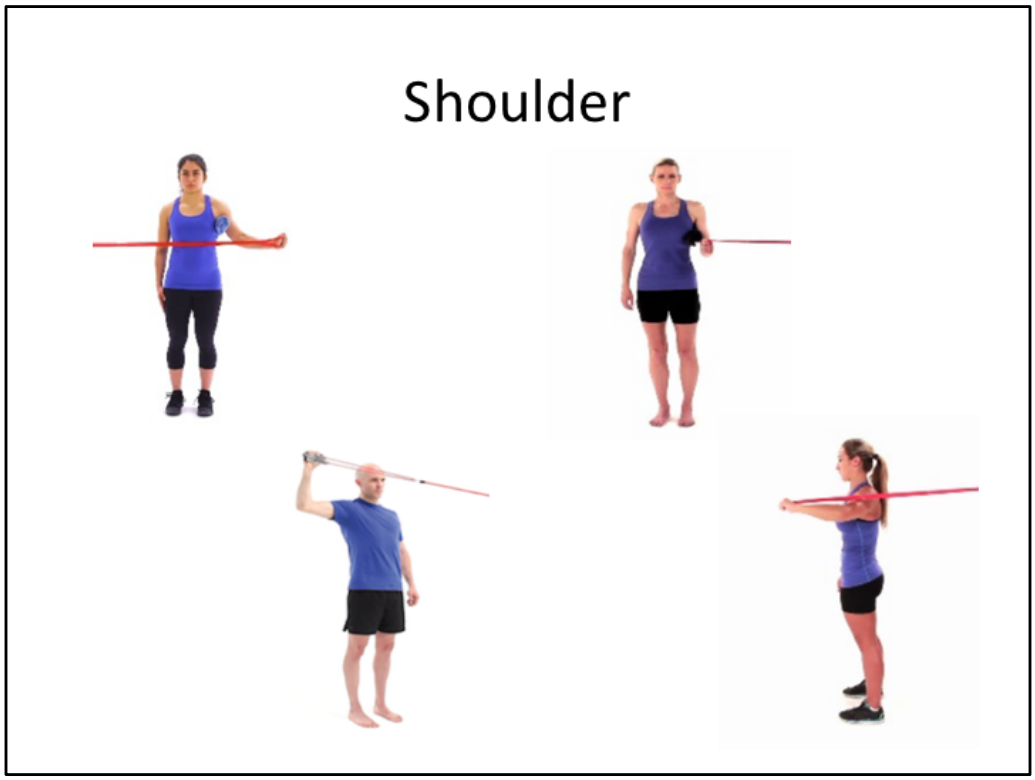
Big toe joint pain, posterior tibialis tendonopathy, knee pain, knee ligament tears can result from hip weakness and poor loading patterns.

Adding the band at the knee and pressing the knee gently into the band as you squat up and down increases your hip recruitment. It is nice way to train hips for endurance and promotes this motor pattern and better alignment.

The single leg picture in the middle is a progression for people that are not challenged with a double leg squat.

The hip roll on the right is a good butt work out without using the knees.

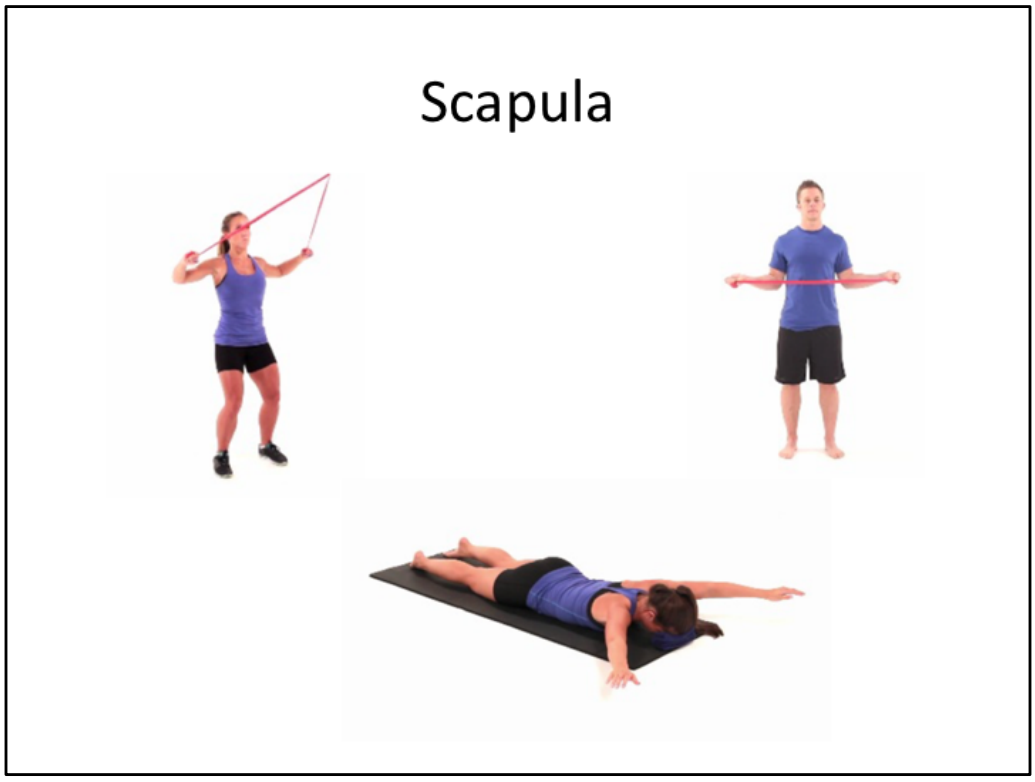
Keep your hips/gluts strong, they carry you through thousands feel of elevation gain and loss on your Mountaineer outings.



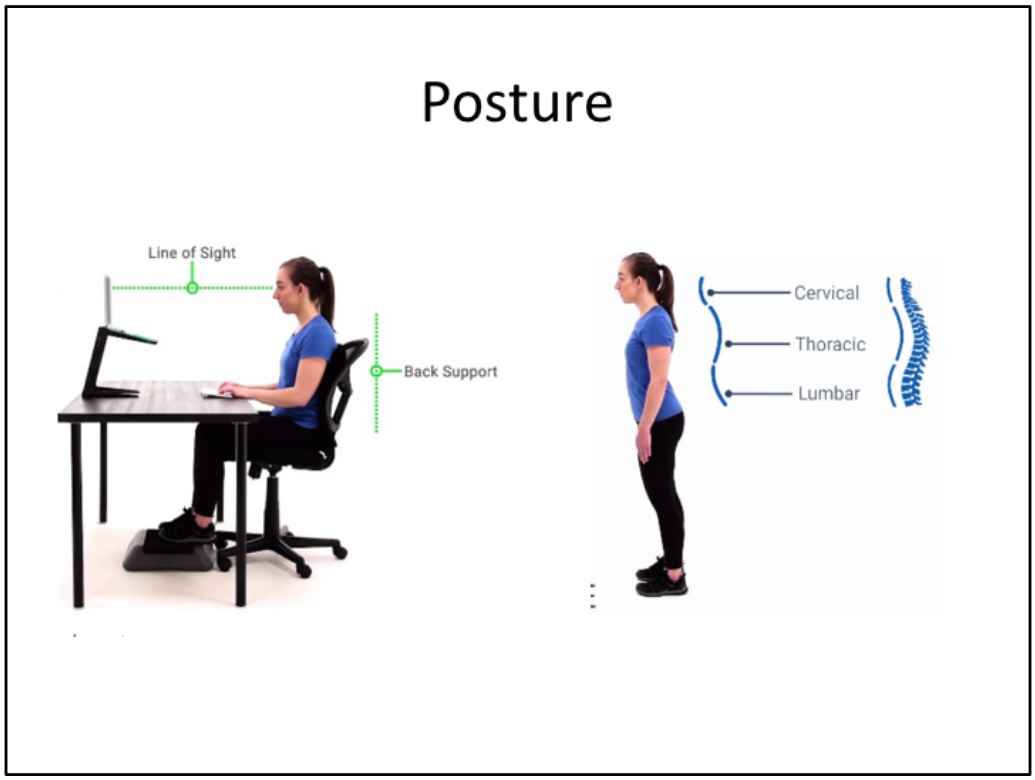
In general, training the rotator cuff is a way to help keep your shoulders feeling good.

Biceps, triceps, deltoid, pecs, lats are all large muscles that do the heavy lifting. They allow you to do that pull-up or lift that heavy pack up onto your shoulder.

The rotator cuff are the smaller muscles that keep the head tracking in the socket.
If your cuff is weak or otherwise inhibited, it is like having a screw loose and the ball will shimmy around in the socket and starts rubbing tendons. This change the mechanical leverage and the muscle/tendons have to work harder to do the same job.
The rotator cuff keeps the train on the tracks.
It is often a break down in the cuff or the scapular muscles that is a precursor to shoulder pain.
Add some rotation training to your training 1-2 times a week.
These muscles are designed for endurance so training them with higher reps (where you feel fatigue at 25-30 rep range) will keep you targeting your cuff with training for endurance which is how it is designed to perform.



These scapular (shoulder blade) training exercises go along with keeping your shoulders happy



A work station set up is about 90 degree angles: Hips, knees, elbows at 90
Monitor up at eye level.
Lap tops and phones really should not be used for prolonged work. If you are going to sit and work on a project have a lap top stand and and external keyboard. I see folks in coffee shops all the time with these step ups. They are cheap, compact, and into fit in your computer case.
Most companies with buy you the tools you need to set up your work station to accommodate posture and ergonomics.
Sit stand desks are affordable and worth considering if you are a 8+ hour a day computer worker.
Get one that goes up and down easily. If it is heavy to lift it is just as bad as sitting ;-)

Reverse Computer Posture



- Collagen will creep under low load prolonged tension
- This will cause micro trauma to the tissue, reduce hydration, reduce elasticity, reduce passive support. This why prolonged sitting can be so detrimental.
- Get up and move!
- The pictures show passive mobility work on the foam roll and active isometric endurance work for postural muscles

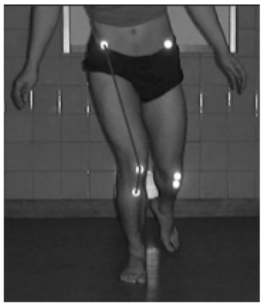
We need extension in our Thoracic spine (area of the spine where your ribs attach) to get up tall pull our head in line with our shoulders and pelvis.
Classic posture is for the ear to bisect our shoulder, which bisects our midline of the hip/pelvis and lastly our ankle bone.
Upper back strength helps us to sustain prolonged sitting postures (but do sit all the way back in your desk chair and use it to support you rather then sitting perched on the edge of your chair).

The middle picture is a lady holding weights out at a 90 angle of the should as long as she can hold them for isometric training. Try it, you will feel your back get tired. Find a weight that causes fatigue in under 20 seconds to build postural strength.

Knee pain/Patella Femoral Syndrome

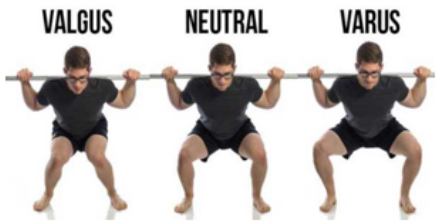
Problem List

- Often find a valgus pattern of loading (lower limb collapses inward)
- Weak hips



Training Plan

- Strengthen your hips (Slide 12)
- Use trekking poles
- Mindful of loading alignment when training



When at the gym use a mirror, consider your form, alignment, symmetry. See if you can pick up on lazy movement habits. Do reps to solidify motor patterns that are advantageous.

When you climb and hike, just have fun! Don't worry about analyzing your form.

1st toe Pain Prevention

Problem List

- Reduced motion in 1st toe
- Weak foot muscles
- Weak hips

Training Plan

- Increase toe mobility

- Increase foot strength

- Increase toe flexion strength

Raise up high on big toe (do not roll out To the outside toes)

This is a bunion or hallux valgus
Flexible slipper shoes, climbing shoes, and walking bare foot when you have weak feet may cause discomfort.

Keep your feet strong and they will support themselves. We spend so much time in shoes that we often do not have the intrinsic strength in the foot to them tolerate bare feet or flexible shoe wear.
Single leg balance works the intrinsics of the foot and the ankle as you work to keep your balance, arch squeezes, and calf raises are also options.

Stretching with heel dropped off the edge of step (calf stretch) after your workout is a great idea.

Rigid shoes like Mountaineering boots, ski boots are a toss up. Some people do well because there is much less motion required of the toes.
Some folks find them to painful often because of fit issues and needing a larger toe box.

Ankle Sprain Prevention

Problem List

- Ligamentous laxity
- Reduced Proprioception/balance
- History of ankle sprain correlates with hip weakness

Training Plan

- Balance
- Ankle strength
- Train your hips (slide 12)

Don’t forget to include some balance training your workout. If you have had an ankle sprain make sure your restore full mobility of the joint and do some balance, ankle, and hip training after the injury.

Studies have repeatedly shown a correlation of reduced hip strength in people with ankle injuries

Elbow Pain Prevention

Problem List

- 70% 0f lateral epicondylitis has its origin in the Neck dysfunction
- Poor posture
- Repeated micro trauma

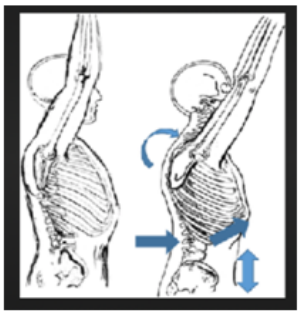
Training Plan

- Address Posture
- Take many breaks from the computer
- Neck, upper back, scapular endurance
- Eccentric training to wrist extensor tendons

Shoulder Pain Prevention

Problem List

- Poor posture
- Weak rotator cuff
- Scapular weakness



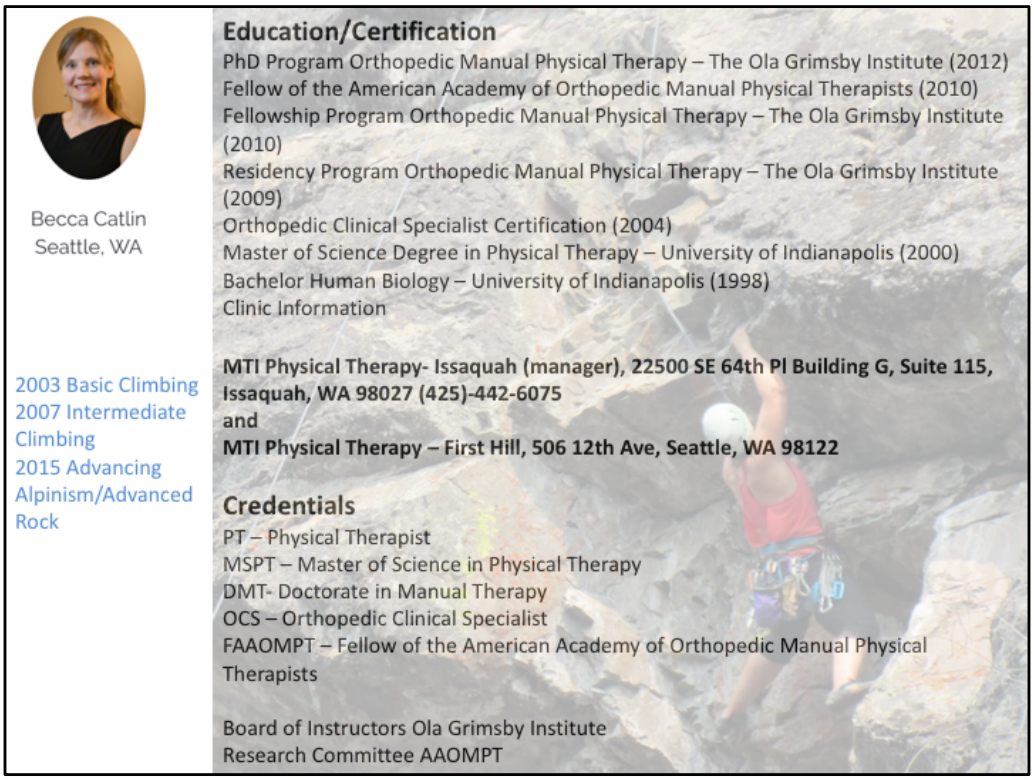
Training Plan

- Manage posture
- Strengthen rotator cuff and shoulder blade muscles (slide 13,14)

Good posture is also necessary for healthy shoulders.
Sit slumped and raise your arms up as far as you can.
Then sit up tall and raise both arms up as far as you can.
Notice how much farther you raise your arms with good posture.
The shoulder hits its end range much sooner in a slumped rounded shoulder flexed spine posture.
This reduced the amount of room inside the joint for the head to glide around and can cause impingement of the ball against the tendons.
To have full shoulder elevation to 180 degrees we need flexibility in our thoracic spine (upper back/ribs).
This is simplified, but reasonable points to target in order to help keep your shoulder happy.

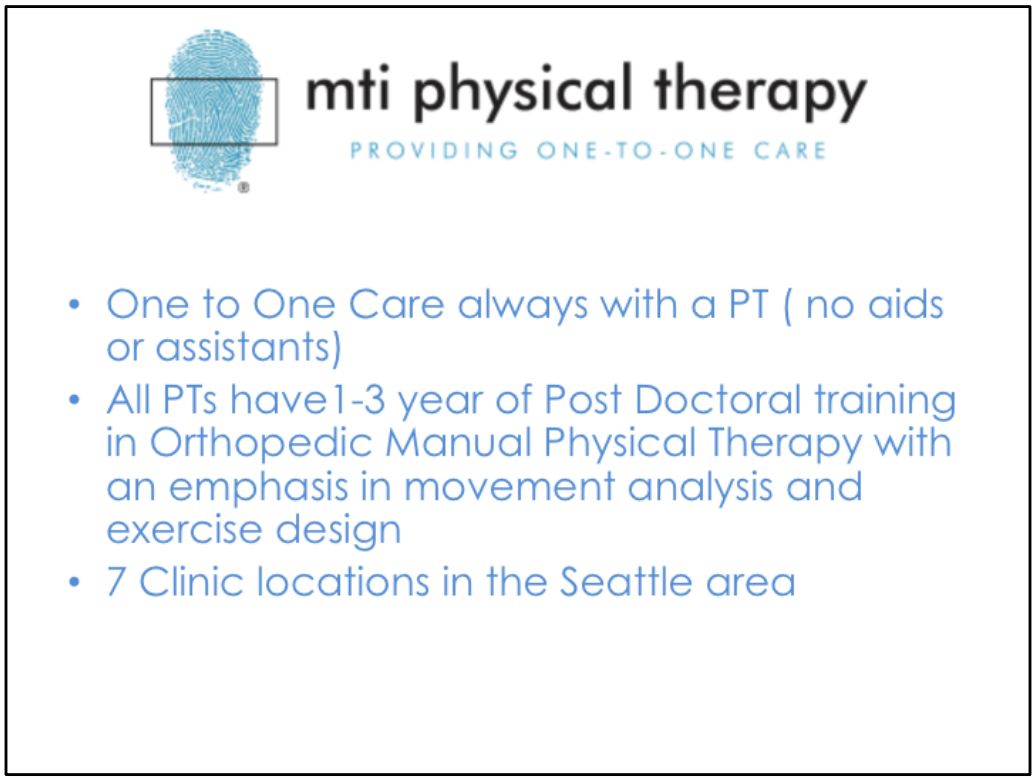
General Dosage Concepts

- Good form with exercise is paramount
- Endurance training increases the network of capillaries for efficient O2 distribution and allows a muscle to perform at low levels for long periods of time. Endurance trainings occurs when working at about 60% of your 1 rep max or gentle fatigue at about 25-30 reps.
- Strength and hypertrophy are trained at 80+ % of 1 rep max or Fatigue at <10 reps
- A hybrid of the two mixing strength and endurance is shooting for muscle fatigue at around 15 reps.
- Plyometric training utilizes Power which is speed + strength (jumping, dynos, throwing)



I am passionate about about what I do as a PT and I love to climb.
I have 15 years experience as a PT and 14 years as a Mountaineer.
My professional career led me down a path of clinical mastery. I became increasingly captivated by the desire to help more people get more out of their bodies. I love anatomy, biomechanics, and challenges. I trained, studied, and treated thousands of hours in the clinic over 15 years. I hold the highest designation a PT can obtain nationally and internationally as a Fellow in the AAOMPT and now teach within a Fellowship training program and mentor PTs from across the US and from overseas. I see my job as a calling. I love to share what I know in order to help others maximize their function and get back to doing what they love to do.

I did an internship in WA while in PT school and fell in love with mountains (we do not have those in IL where I grew up). I knew I had to come back and satisfy my curiosity to see the view from the top. After I graduated from PT school I did come back to WA and have been climbing ever since. I am grateful for the Mountaineers where I learned skills to climb and found a climbing community. I have had many adventures through the club, gained friends, and continue to have that insatiable curiosity to see what lies over that next ridge, and immerse myself in the great beauty of our world.



Our practice style continues to be informed by the latest research, course work, and our involvement in clinical mentoring and teaching both nationally and internationally. As you work with your therapist, you will recognize the difference in MTI's approach and your practitioner's clinical skill. We know that your experience at MTI will be unique for you, educational, and allow you to meet your individual goals.

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