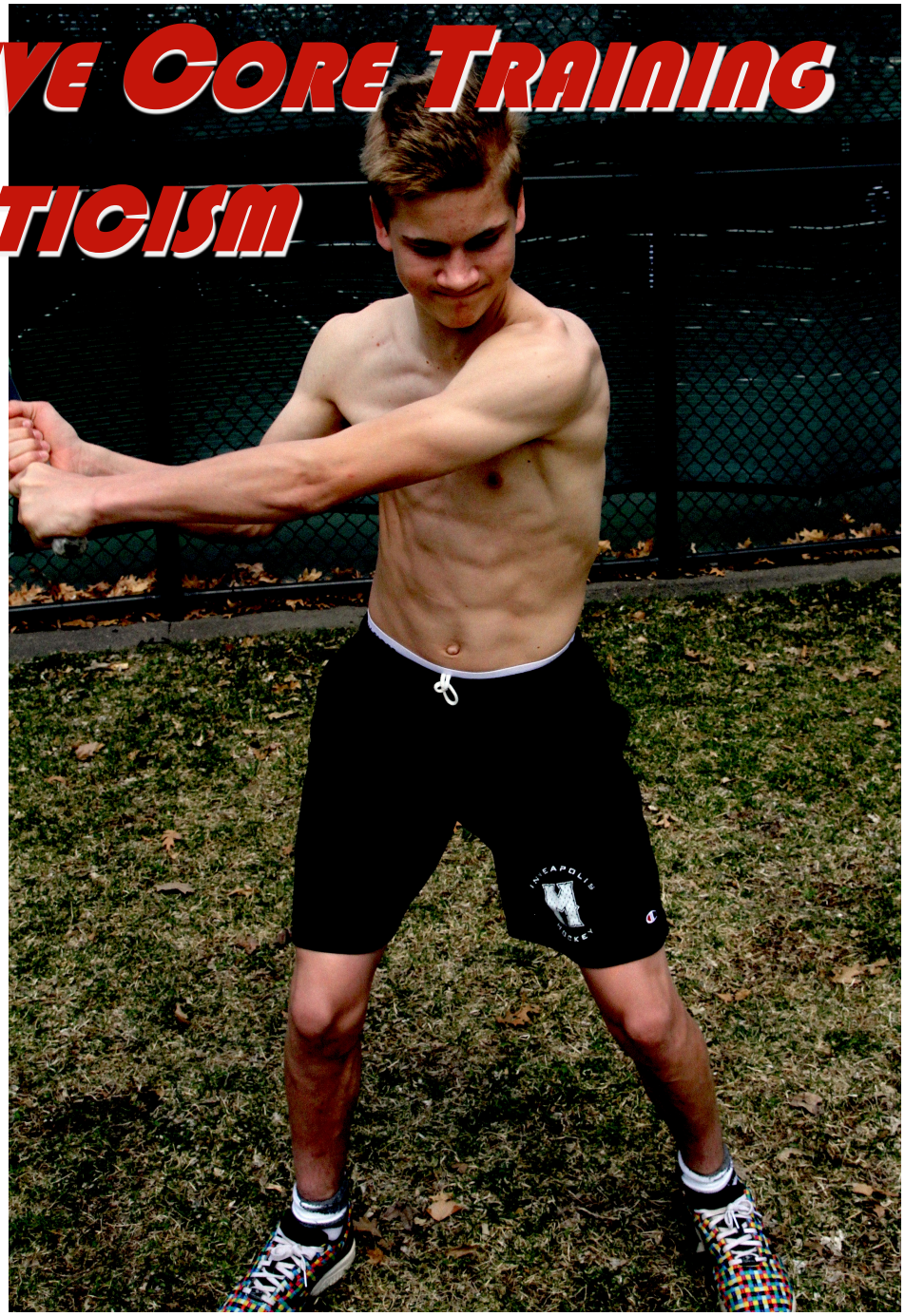
Train Core muscles to work WITH muscles that move limbs

Don't isolate core muscles.
This is not middle-age fitness;
the object is building elite athleticism,
NOT six-pack abs for little or no athletic benefit.

Teenagers should train the core while playing other sports, and by whole-body movement: twisting, throwing, jumping, wrestling

– like a cheetah

Dynamic Explosive Core Training to Develop Athleticism



During adolescent years when nerves are refining coordination …. we should train with complex Whole-Body exercises, not with isolated muscles.

Note: One of us would hold the camera, the other would swing the tennis racket to show core muscles in action. It didn't take long to decide I'd be a good camera holder.

Resisted Shooting Motion

A-R-E

using

Core & Gluteal Muscles











Med-Ball Side Toss

Arms extended in front of chest



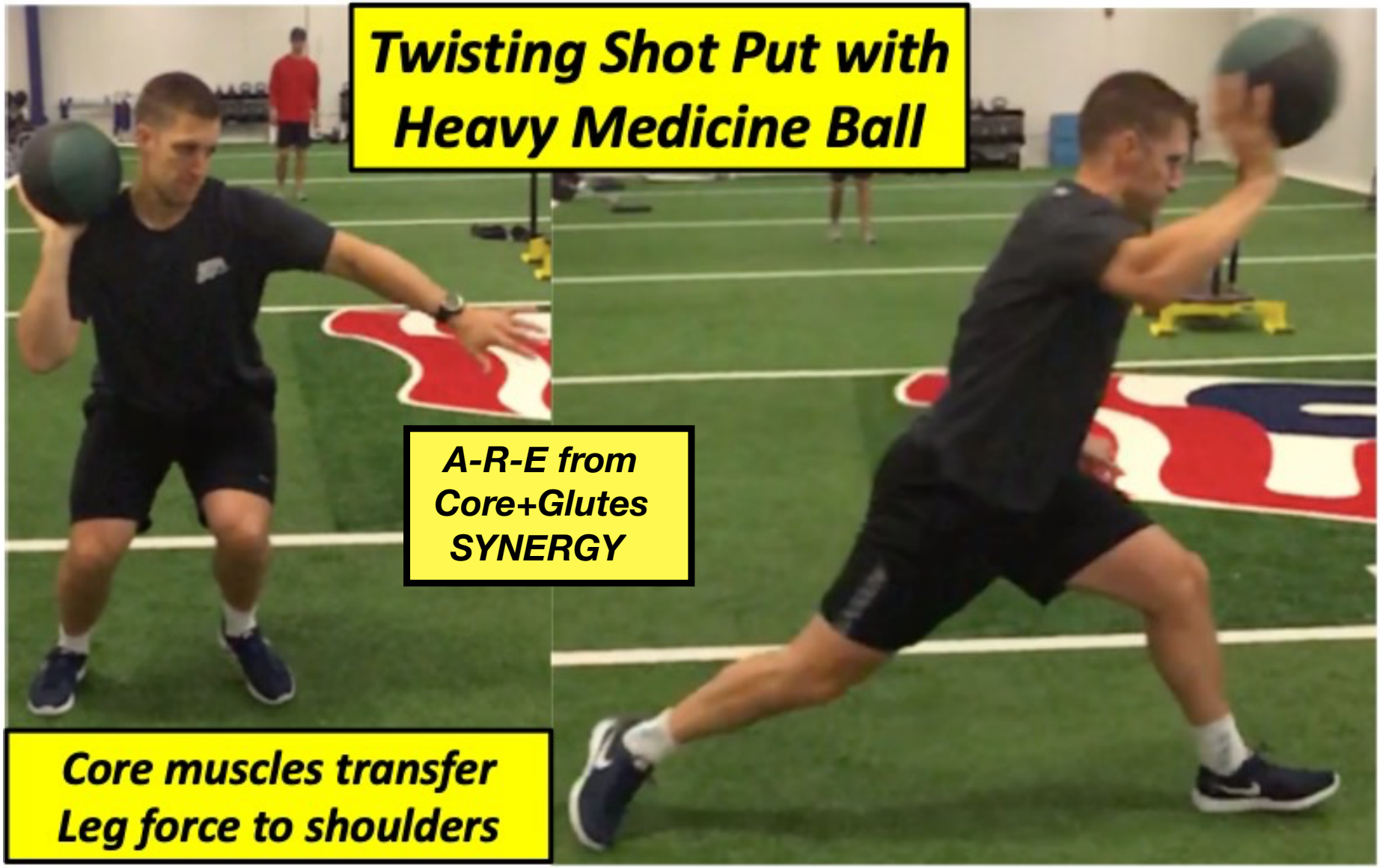
Stand 8-12' Apart

Throw Hard!!!

because catching is half the stimulus

External Oblique m contracts along with other deep core muscles during all throwing exercises.




Twisting Shot Put with Heavy Medicine Ball
A-R-E from Core+Glutes SYNERGY
Core muscles transfer Leg force to shoulders

Squats and Bikes limit dynamic motion, unlike skating

Limiting range or speed of hip motion in training pre-disposes athletes to groin-hip injuries.

This does not mean bikes & squats should be eliminated, but a WIDE VARIETY of exercises – some with greater range and speed of motion – is required.

Hockey training should NOT restrict hip movement to a box.





Training hip muscles in a box – or phone booth does NOT prevent injuries or build athleticism.



Both the RANGE & SPEED of movement are essential.

Kyle Okposo played 17 seasons and 1051 games in the NHL. His top speed stride in a summer Overspeed workout when he was 16y/o shows why off-season training should not be limited to a box.

Lying on a mat, isolating abdominal, hip, and back muscles may be necessary for 'patients' with injuries or athletes with weaknesses.

But to prevent injuries and increase athleticism, training must eventually GRADUATE to:

(a) high speed movements, as fast as sprinting – uphill, downhill and on a level track;
(b) every possible hockey range of motion, and that's REALLY a wide range;
(c) skating-specific exercises with hyperextension and wide hip abduction-extension;
(d) unstable footing to prepare for imperfections on the ice;
(e) on-ice Overspeed sprints, including quick stops-starts (6-10 sec).





Abduction-Rotation-eXtension, and Straight-Line-eXtension build explosive power, but increase the chance of groin and hip flexor strains if there is insufficient preparation

Every skater recognizes how important the quads are in leg extension at the knee. Perhaps this is the reason weight training has focused so myopically on this, neglecting the critical source of power (& injury) from hip Abduction-Rotation-eXtension.

But … the better we become at ARX and SLX, the greater stress we put on hip flexors and groin (adductor) muscles to slow the movement to zero velocity at the end of the stride; then, pull the leg back during recovery.

Groin, hip and core muscles are too often not trained explosively off-ice, resulting in a semi-preventable epidemic of injuries in the NHL.

Functional definitions:

ABDUCTION: ***Thrusting the leg to the side from the hip.***

ADDUCTION: ***Returning the leg back toward the midline, after abduction.***

HIP EXTENSION: ***Pulling the leg from the hip straight backward and down as in squats.***

HIP FLEXION: ***Pulling the leg forward after hip extension.***

Adductors and hip flexors reverse the ARX and SLX motion during recovery phase. This is particularly stressful, because of the speed of movement.

If – at the end of the stride, the skate blade slips or hits a rut, groin muscles and hip-flexors are strained, because they never reach this position or speed if they're trained in a phone booth all summer.

We can't expect slow isolation strengthening and static stretching of groins/hips to prevent muscle pulls.



Explosive uphill sprinting is the best training to prevent the most common hockey injury.

Is it not 'clinical' enough to be recommended by therapists?

Sprinting Uphill is one of the very best whole-body exercises because:

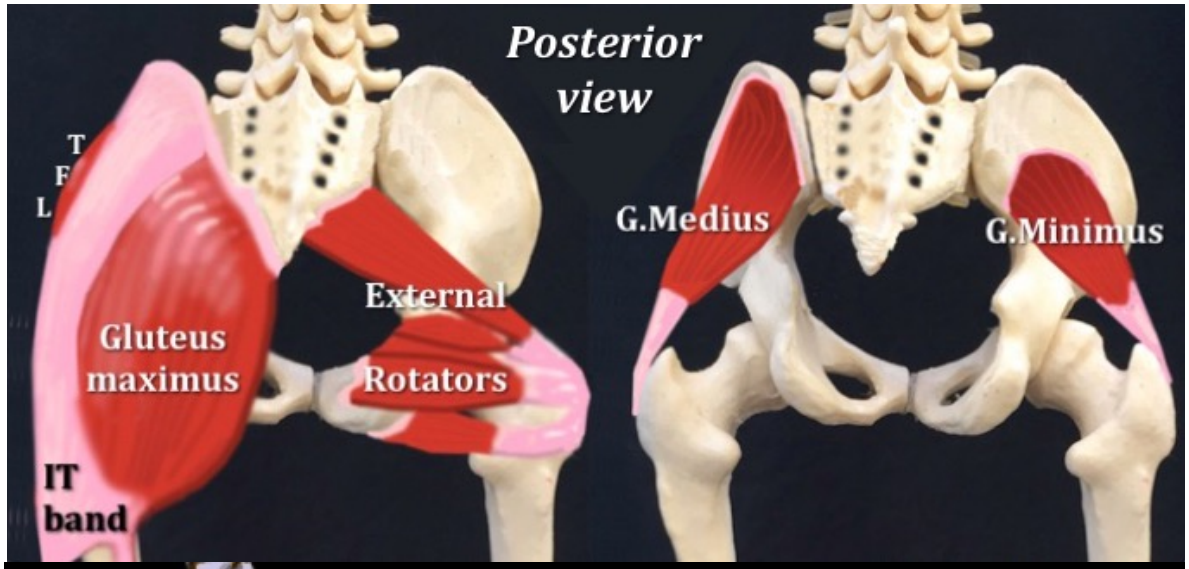


- *Core muscles create synergy with those that move limbs;*
- *Range of motion similar to skating Abduction-Rotation-eXtension and Straight-Line-eXtension at push-off.*
- *Speed of movement at least as fast as skating, so it improves skating stride rate;*
- *Arms are essential for both: uphill and skating;*
- *Statistically high relationship to skating improvement;*
- *Helps prevent hip-flexor skating injuries if trained with gradual progression, and avoiding over-use.*

Skating Power from the Hips

Abduction
Rotation
Extension

Abduction from the hip by all 3 Gluteal muscles.





Gluteus Maximus:
Inserts on both the Femur and IT Band, so it performs two functions: abduction & extension

Gluteus Medius:
Gluteus Minimus:
Insert on the trochanter of the Femur for maximum leverage during abduction.
Notice (above) the neck of the femur provides leverage; skating would be impossible without this long neck.

Illio-Tibial Band:
Serves as a tendon for both the Gluteus-Maximus + a muscle near the front: Tensor-Fasciae-Latae

A helpful video at ... STUDY.COM
http://study.com/academy/lesson/muscular-function-and-anatomy-of-the-legs-major-muscle-groups.html

Note: given strict copyright laws, I use a halloween skeleton from my closet and draw the muscles myself using PhotoShop.

So, if you choose to reproduce them for educational purposes, you will not be sued.

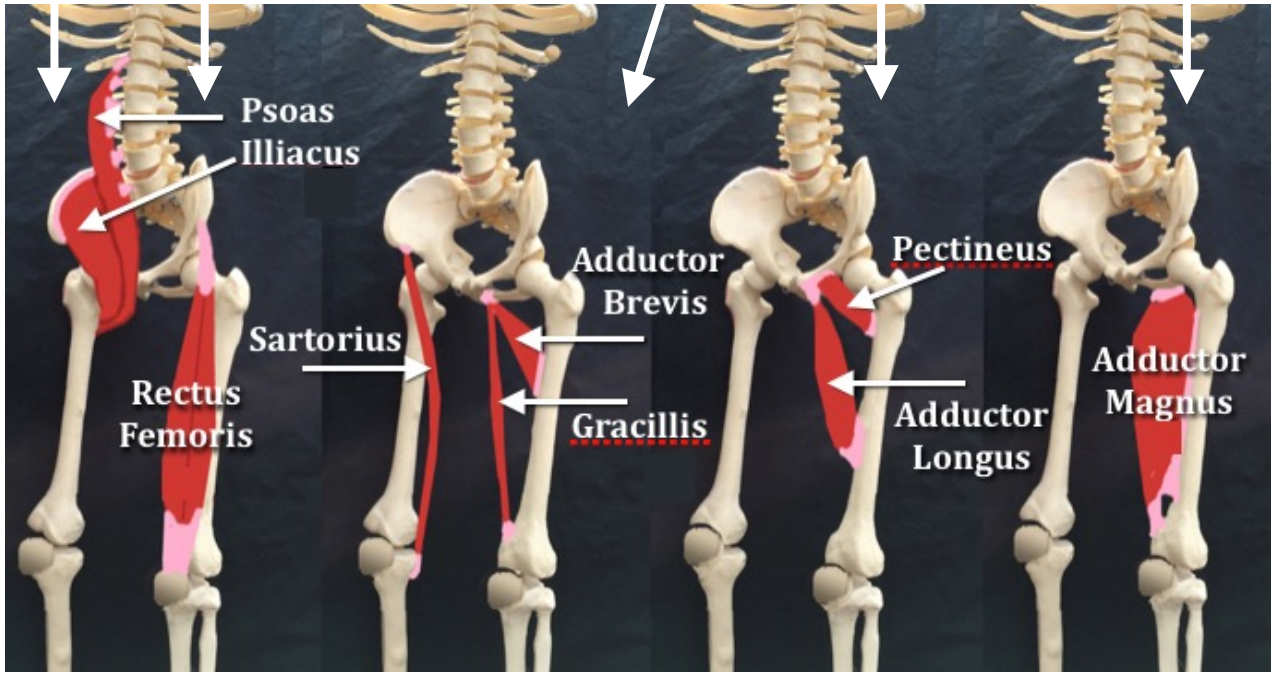
Injuries to hip-flexors & groins occur because these muscles are not speed-trained in the off-season

With each ARX thrust from Glutes and Hamstrings, recovery requires rapid adduction and hip flexion.

There is no reason to memorize this anatomy. However, your career depends on preparing Hip Flexors & Adductors for explosive skating.

Notice where each muscle originates and inserts (pink tendons). Realizing that muscles only contract (pull, not push), you can determine the function of that muscle. Rectus Femoris, for example spans two joints, so it has two functions: (1) Leg extension at the knee, like other quadriceps … plus (2) Hip flexion.

Hip Flexors **Adductors (Groin)**



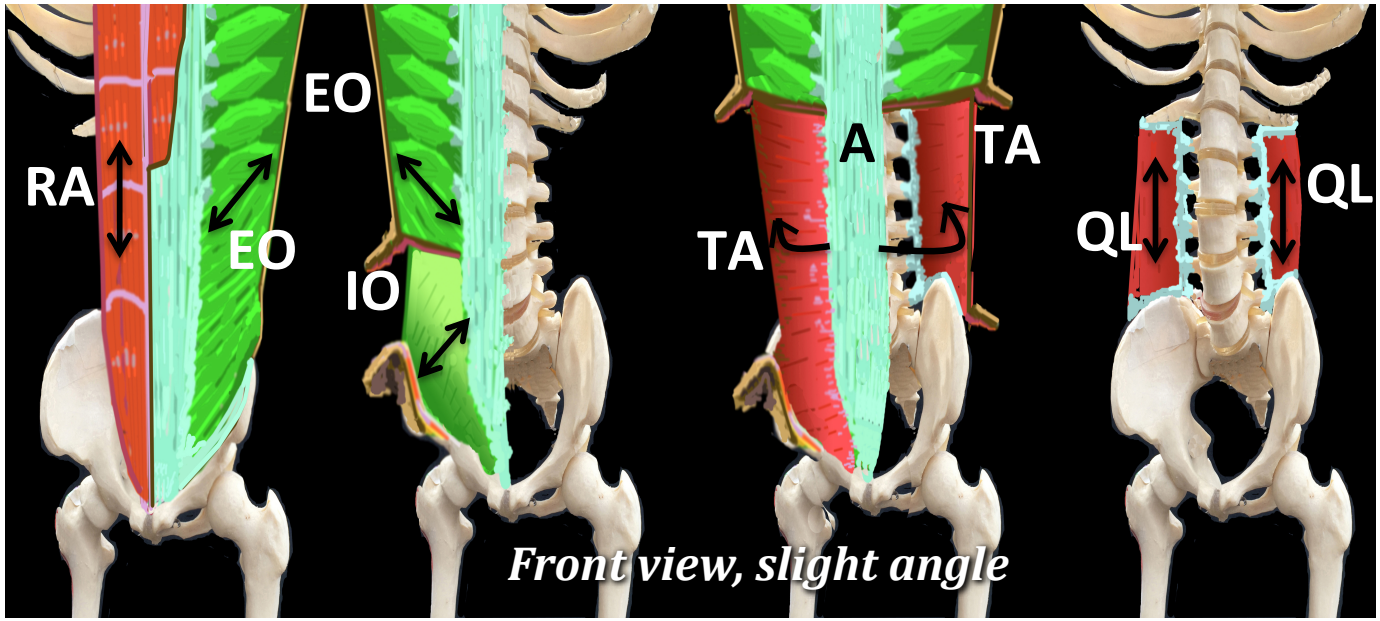
***Abduction-extension** puts tremendous strain on groin/hip muscles that contract (eccentrically) to stop the motion before the joint reaches a deleterious position at the end, and sometimes the skate blade can slip a little at this point. Then, in the recovery phase they pull the leg back to the midline. This is all done at high speed, therefore, these muscles must be trained at high speed with unstable, unpredictable footing late in the summer. Sprinting on a level surface or uphill will help prevent hip-flexor problems.*

Core Stability: works synergistically with Abduction-Rotation-eXtension

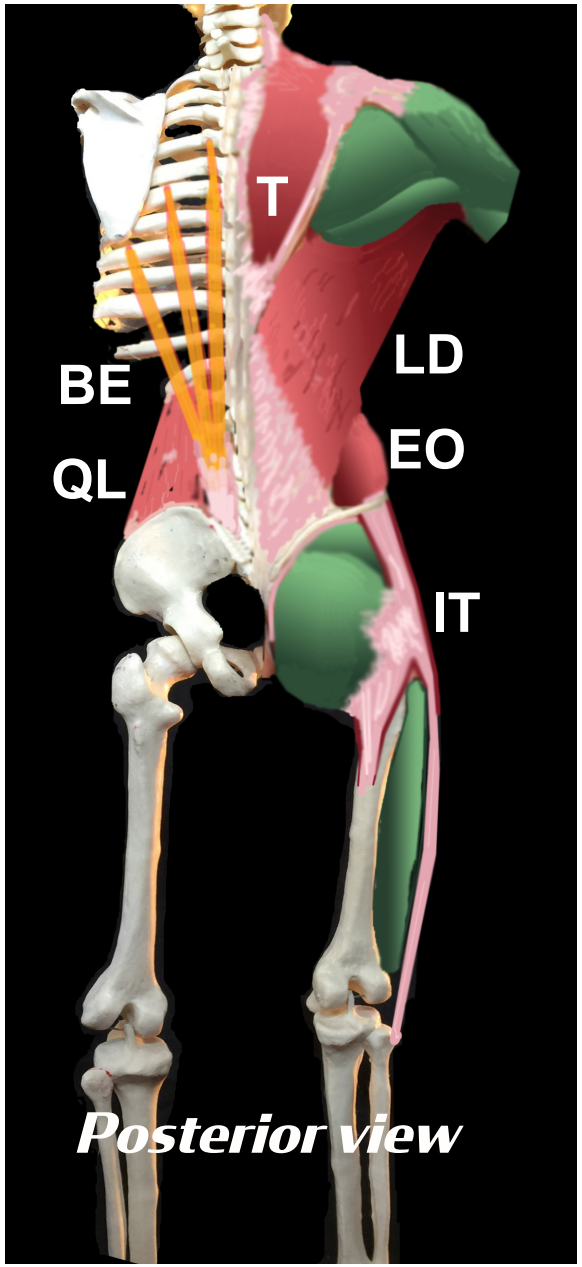
When a muscle contracts it pulls on bones at both ends of the muscle. Example: Gluteus Maximus is the largest muscle in the body, and when it contracts to abduct or extend the leg, it also pulls just as hard on the pelvis and vertebrae, so core muscles must stabilize the pelvis and vertebral column during skating or running.

Dr. McGill (2009) calls the core muscles "anti-motion" muscles. Rather than initiating motion, they stabilize the trunk of the body (like a 'SOLID CYLINDER').

Some core stabilizers are shown below:
Front View: from superficial to deep as you view left to right.
Each layer 'cut away' to show the deeper layer as you move to the right.
Black arrows show direction (or plane) of contraction.



RA: Rectus Abominis, *"Six pac ab," for looks; not as important for stability.*
EO: External Oblique: *largest abdominal muscle, and it contracts nearly perpendicular to IO.*
IO: Internal Oblique: *deeper layer under EO.*
TA: Transverse Abdominis *wraps completely around the midsection like a wide weight belt. One of the most important core muscles for stabilization.*
QL: Quadratus Lumborum *a deep back muscle, prevents the vertebral column from bending to the side when you abduct.*



Posterior Stabilizers of the Spine-Trunk

To balance or co-constrict with the abdominal stabilizers, (shown on the previous page) the muscles in red or orange are some of the many that stabilize the spine-trunk from behind.

Muscles in green move limbs.

LD: ***Latissimus Dorsi***

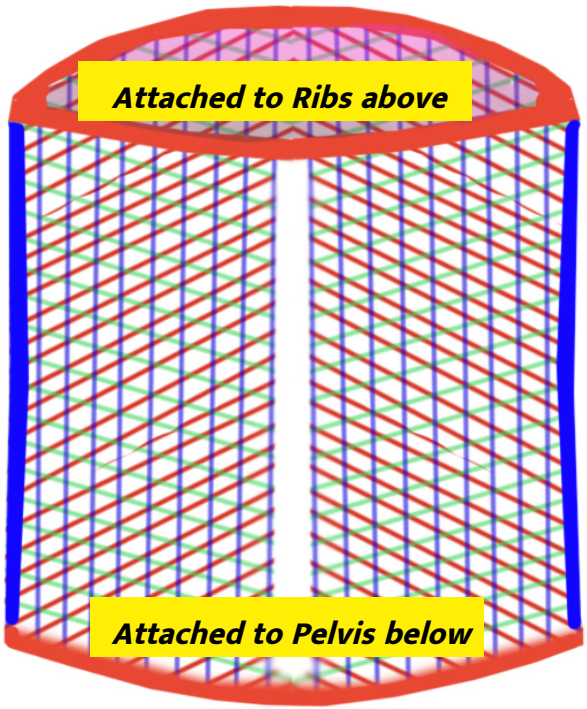
EO: ***External Oblique***
(see previous page)

QL: ***Quadratus Lumborum***

T: ***Trapezius muscle***

BE: ***Back erector group (orange).***
There are many, but only three are shown.

IT-Band: ***Not a core muscle, but***
Notice how Gluteus Maximus tendons (pink) insert on both the IT-Band for hip abduction, and on the femur for hip extension.



The core becomes a rigid cylinder when muscles co-contract at different angles.

LAYERS of core muscles are oriented in various directions (diagrammed at left, detailed on previous pages).

By co-contracting just PRIOR TO any limb movement, core muscles and diaphragm make a rigid cylinder around the trunk (Hodges, 1997, 2000). Eg: rotational forces initiated from the legs and hips are transferred through the rigid cylinder to the shoulders and arms for actions like throwing a baseball or discus, or swinging a bat – or shooting a puck.

Similarly, arm and shoulders transfer force downward to the gluteus muscles for skating power.

Stuart McGill (2009) points out that the main function of the core of the body is not to initiate motion, but to brace the core so muscles that move limbs actually move the limbs, not the spine.

This is the reason for training core muscles with dynamic movements, creating synergy between core muscles and those that move limbs.

An example of this is shown on the next page. With no instruction other than "Use your legs to throw a med ball as high as possible," athletes explode into SLX (straight line extension) on the Iirst attempt.

To throw a 5kg med-ball 3m above where it is pictured on the next page he builds momentum by transferring forces in a vertical line up through the core to the shoulders and arm.

This synergy is learned by FEEL, of course, not from a verbal lesson by the coach.



A braced, cylindrical core

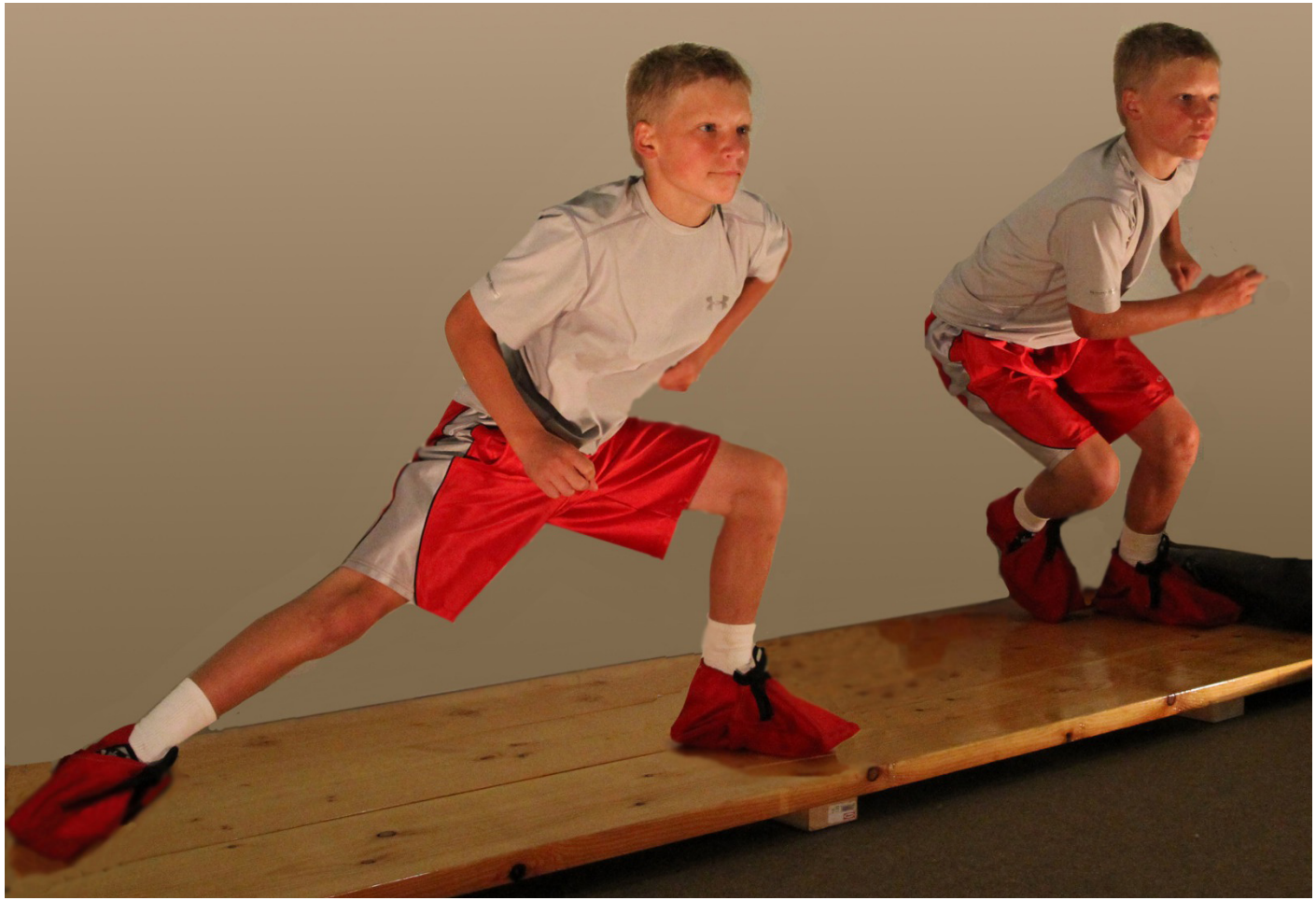
… is the key to transferring ground force to shoulder muscles when you want to throw the medicine ball high.

Biomechanical research** (McGill, 2009), **showed that this movement is limited more by core muscle strength, than by muscles of the shoulder and arm. The opposite is the case if the athlete is sitting, where the chair support means the weakest link is shoulder and arm strength.

This is why overhead dumb-bell press should be done while walking. A little non-secret: Ovi does that.

HIP ABDUCTION and ADDUCTION

After elementary bridges and other isolated strengthening of core, groin, and hip-flexor muscles, core training must graduate to include dynamic, skating-specific drills. Think outside the box for advanced training.



Hockey Endurance and Groin-Hip Stability

The slippery surface is good preparation to prevent groin-hip injuries on ice.



The goal for core training is to create SYNERGY between core muscles and others that move limbs.

Side notes: Once players are familiar, it will look and feel more like skating. Then, they'll rotate the hips, as if skating, rather than pushing side-to-side, with feet parallel to each other.

Allow free movement of the arms. They should swing across the body (opposite to leg movement) unlike sprinters, who's leg force is straight back.

Allow the arms to oppose the legs on-ice and off.

This is a physiological reflex.

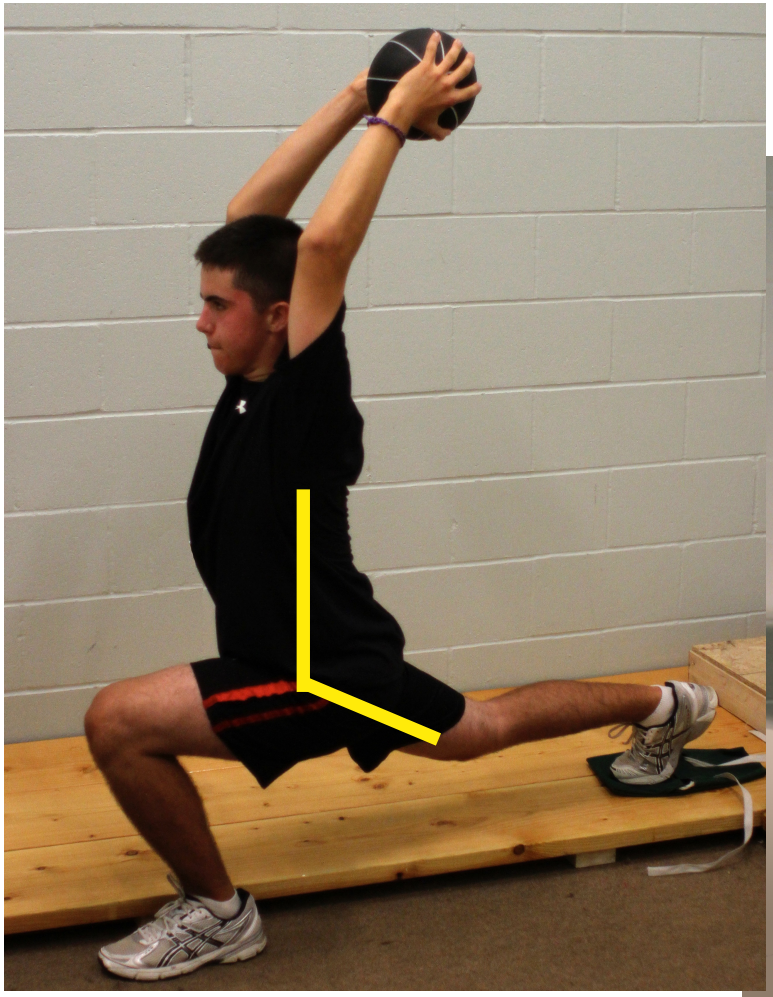
Later you can add stick handling on the slideboard to prepare for the difficulty of moving the legs independently of the arms while skating.



It is difficult to stick-handle while skating super fast. That's why there are so few players who make it look easy. The rest of us just slow down when we're handling the puck.

Practice it on the slide board only after you keep your knees bent without focusing on it.





Hip hyperextension must be trained slowly!

Walking Lunge Stretch



pull the shoulders back and reach high. This is a good stretch for hip flexors as they contract eccentrically.

Sliding Lunge *(above)*
on the slide board add an element of insecure footing that is a source of hip-flexor strains on the ice.

Only after substantial training!!!





Supine plank bridge

Brace in each position if your back, gluteus, and hamstring muscles are in great shape.



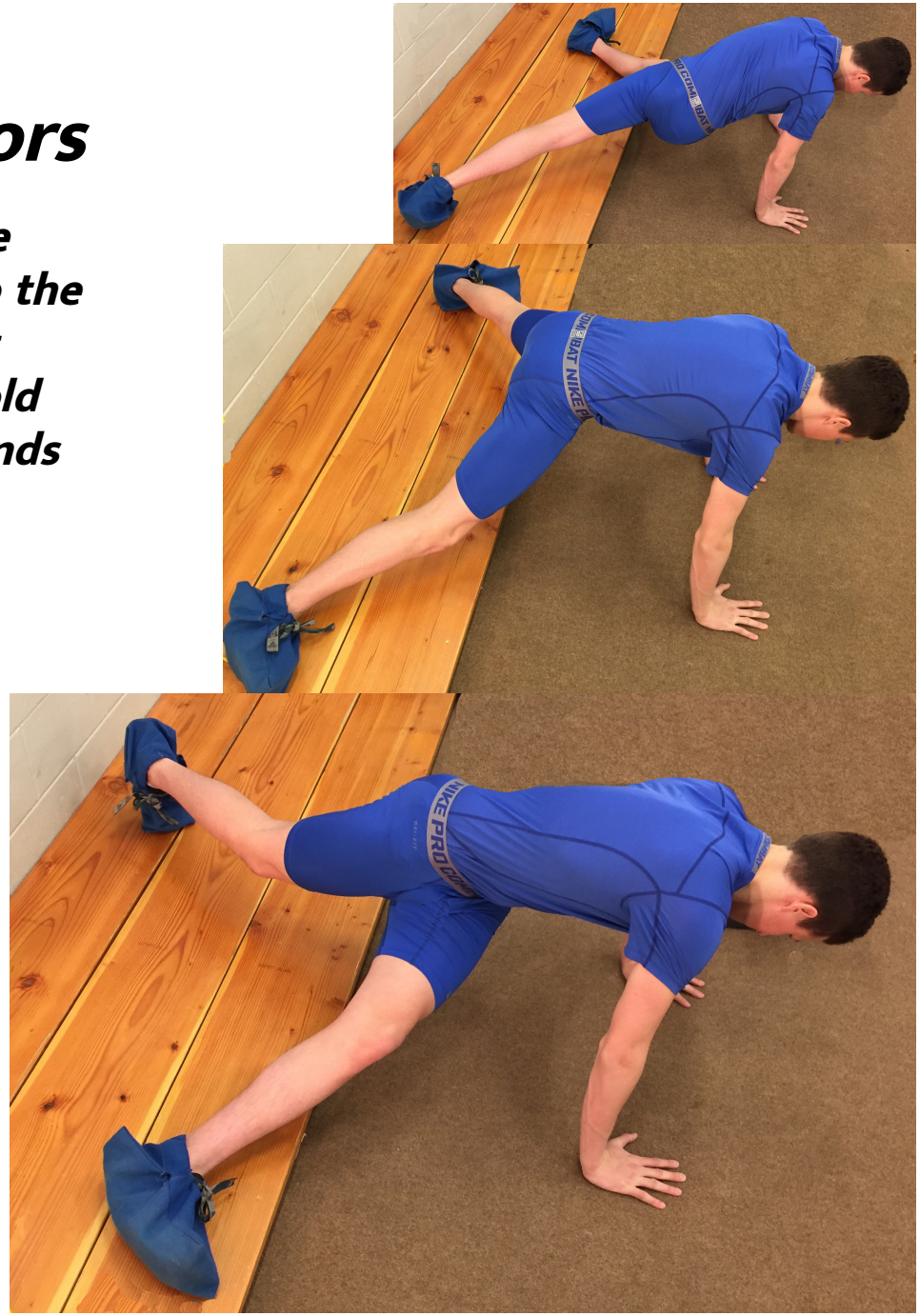
Decline Pushups
while Raising one foot

Bracing the Core to support chest, shoulder, and arm muscles … this promotes Synergy between limb movers and the core!

You don't need many pushups. Hold 5-10 seconds.

Slippery Scissors

It's a bridge on the slide board. The feet slide to the three positions without stopping; or you can hold isometrically for 5 seconds at each position.



"Anti-motion stiffness" (McGill,2009)



Controlled speed Bridging:

In these exercises, core muscles resist against gravity, but in a skating stride they stiffen the core of the body, and resist the torque that would otherwise twist or deflect the pelvis and spine when the gluteus muscles abduct or extend the hips.

Hold the position for 7 seconds, then do a pushup, then turn the other way for 7 seconds … and continue.

Vertical lifts lack abduction and speed throughout the range of motion, so each lift is inadequate by itself.



Incomplete extension because the center of mass is shifted backward with heavy weight, so the lifter must bend forward to compensate

They're all examples of training in a box, not wrong, just inadequate.

One-legged squats create less sheer force in the back (McGill, 2007), and are safer because dumb-bells can be dropped. They also hyper-extend hip flexors as in skating.

Training exclusively with squats pre-disposes hip flexors to injury.

Hips can't extend fully at the top of two-legged squats if you're lifting a substantial weight.

One-legged squats (next page) do hyper-extend hip flexors, but the overall range and speed of motion is inadequate so variety is essential.

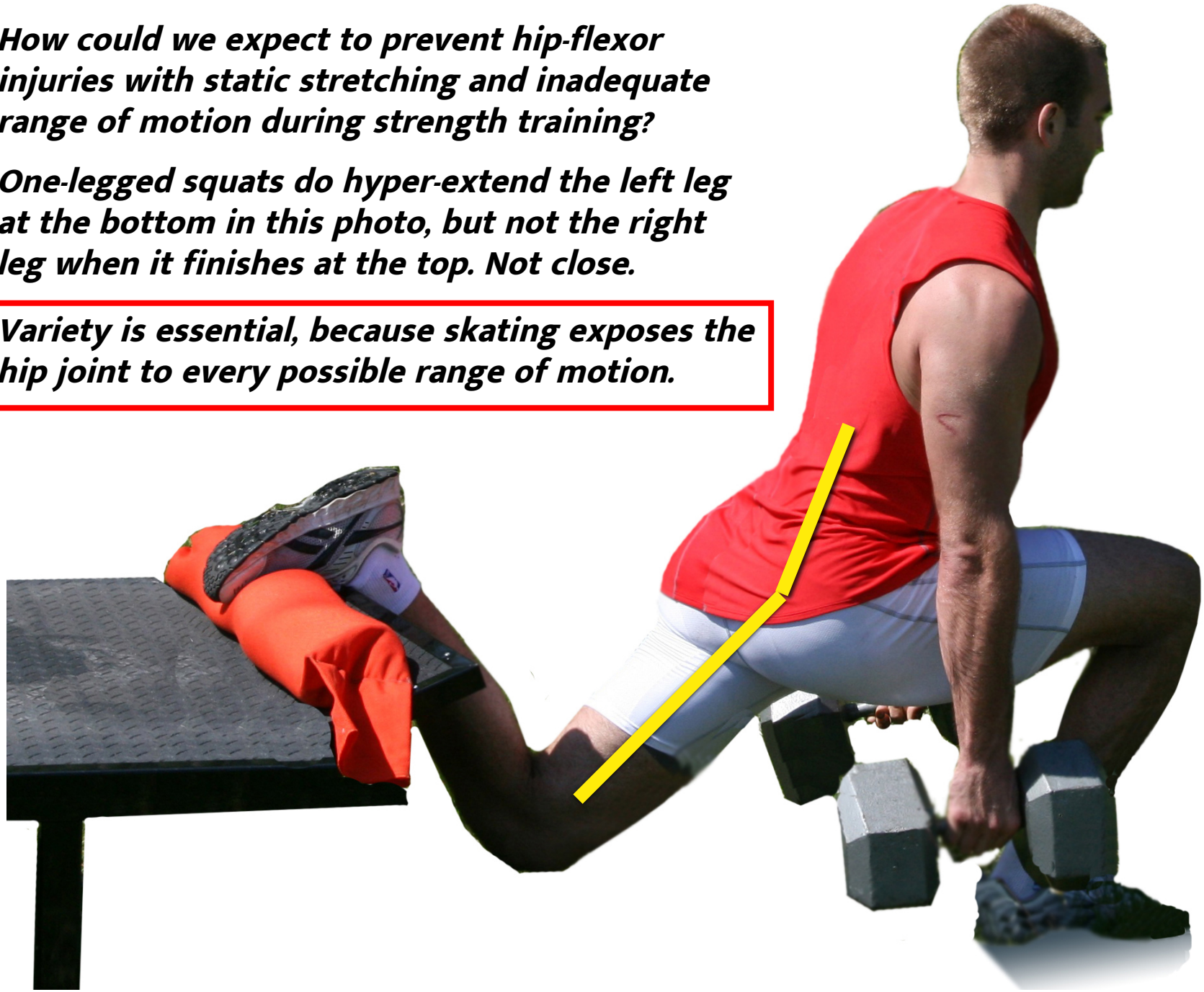
Squats are a good exercise for hockey if there is substantial variety to expand the range and speed of motion.

Note: weight on the right end of the bar was visually removed by Photoshop, only in the photo, not during an exercise. It would not be possible, nor is it advisable to try to lift with weights on one end of the bar only. You might carry a dumb-bell in one hand while walking around the gym to strengthen quadratus and other core muscles.

How could we expect to prevent hip-flexor injuries with static stretching and inadequate range of motion during strength training?

One-legged squats do hyper-extend the left leg at the bottom in this photo, but not the right leg when it finishes at the top. Not close.

Variety is essential, because skating exposes the hip joint to every possible range of motion.





Unstable footing

is important in preparing groin and hip muscles for unstable footing on the ice. No other sport requires this as much as hockey.

The creative idea, using a spring for unstable Dip Squats came from the Buffalo Sabres strength program

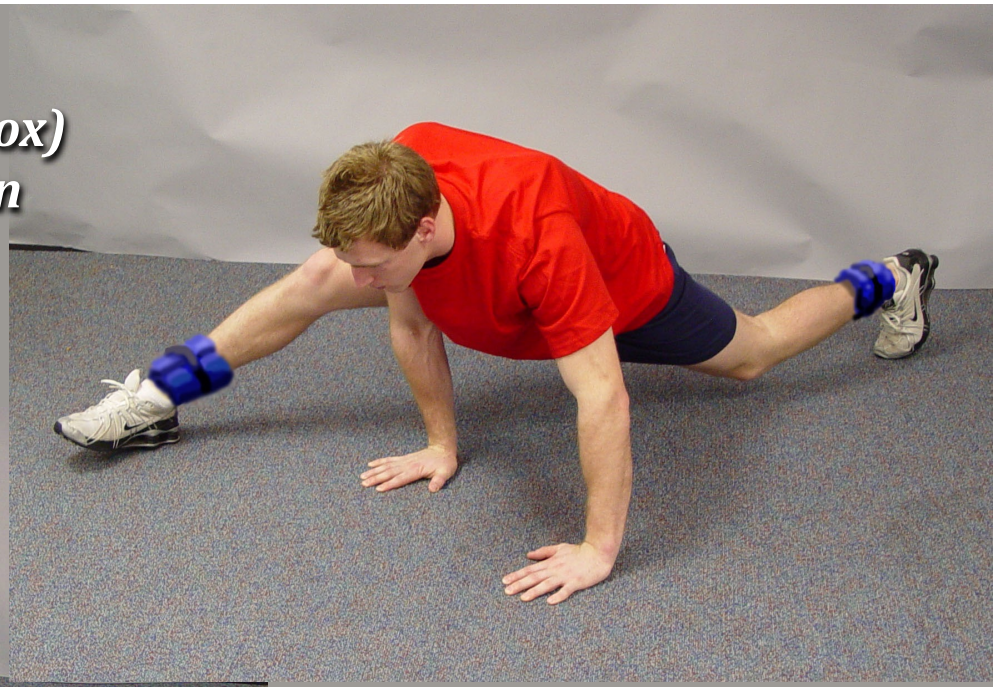


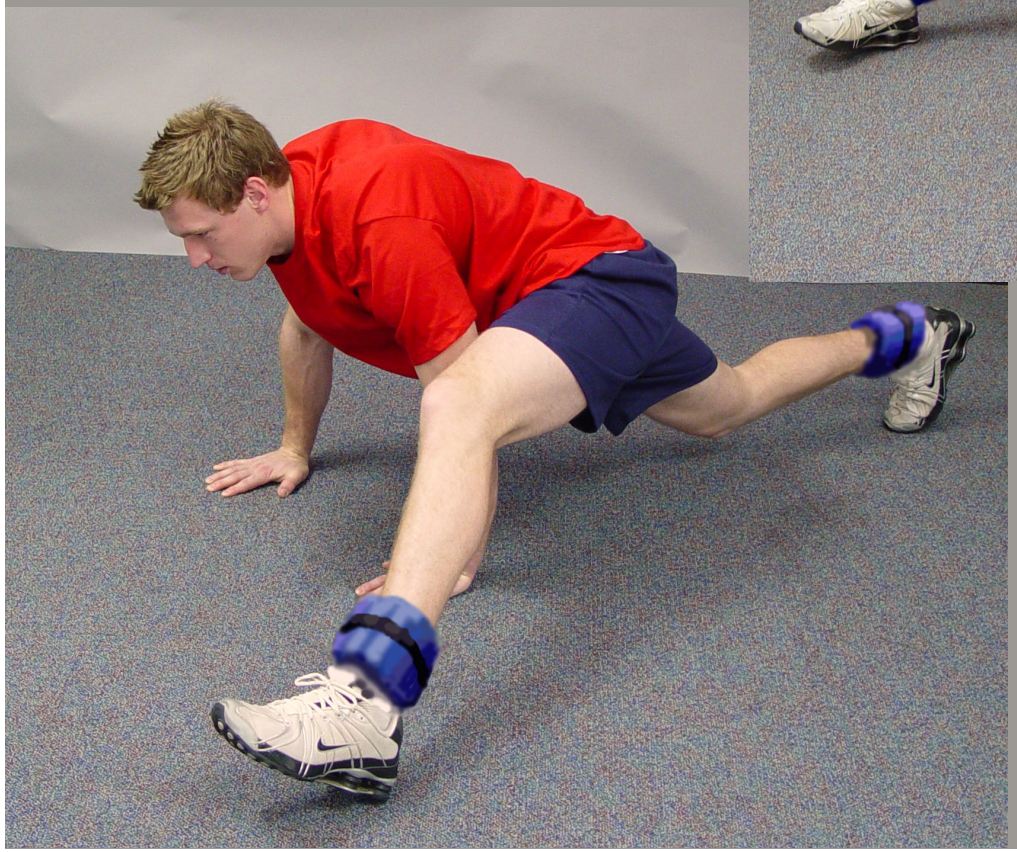
Train off-ice for the REAL world of imperfect ice.



Crab Stretch

Crazy hip motion (out of the box) is important to prevent groin and hip strains on the ice

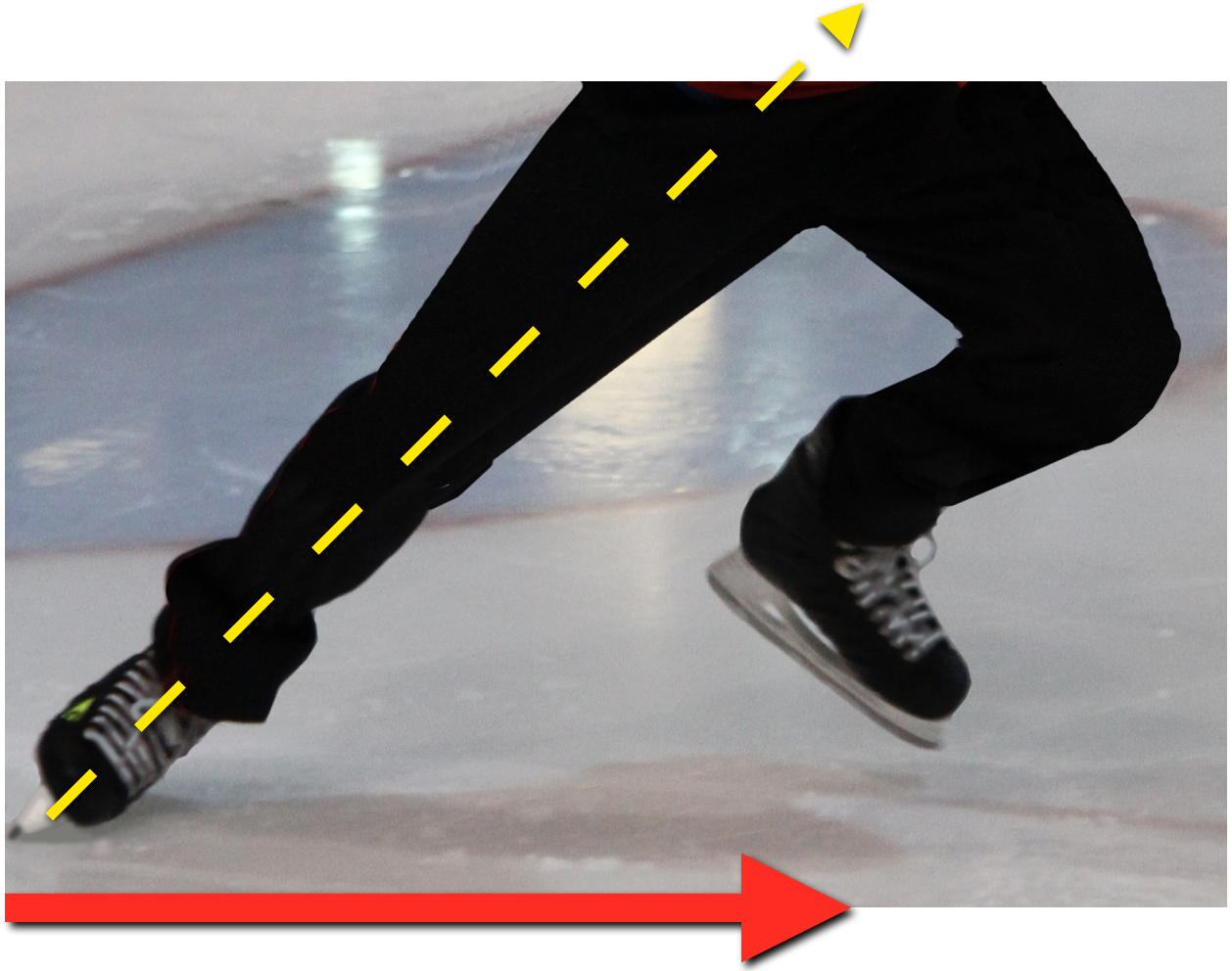




Jump from one position to the other, reaching your heel in front of your hands.

With or without ankle weights, Some reps are done slowly, lowering the hips on each rep. Later in the set, increase tempo and range

The faster you are, the greater the need for dynamic Overspeed core-groin-hip exercises, not just static – or slow – stretching, bridging, and strengthening.



Study hip position in this photo, and recognize that in the next instant the skater will reverse this position by rotating the pelvis violently to the left, and abducting-extending the left leg.

Like no other sport, this high-speed movement puts eccentric-then-concentric stress on groin-hip muscles.

Static stretching, isolated strengthening of core muscles has been tried for decades; yet hip injuries are still epidemic.

Explosive acceleration adds violent stress to the core, so the range, speed and unpredictability of Hockey must be simulated in explosive core training

Core training must ultimately create synergy – upper body together with core and lower body musculature.





Stickhandling a 5# plate is a great core exercise in addition to increasing skill









Narrow Base

makes core muscles work even harder to stabilize against arm torques.

Never, Never, Never

pick something up with your back rounded , not even a toothbrush.



The normal lordotic curvature of your spine (when you stand erect) is correct for all lifts (shown at left).



Romanian Dead Lift

is an excellent stretch and strengthening exercise for hamstrings, gluteal, and back erector muscles.

Allow a slight flex at the knees, keep the bar close to your legs, stick your butt way out, squeeze your shoulder blades together, and lock your hips in this position. Do not go below the point where your back flattens out, even slightly.

Water Pipe

for One-legged squats, Lunges, Twisting lunges, etc.

The water shifts back and forth, requiring core muscles to stabilize.

Don't overfill the pipe. 20% is enough. The less water the more shifting.

Steel or plastic plumbing pipes work very well. Make your own or contact the athlete pictured here ... TPFitness.com

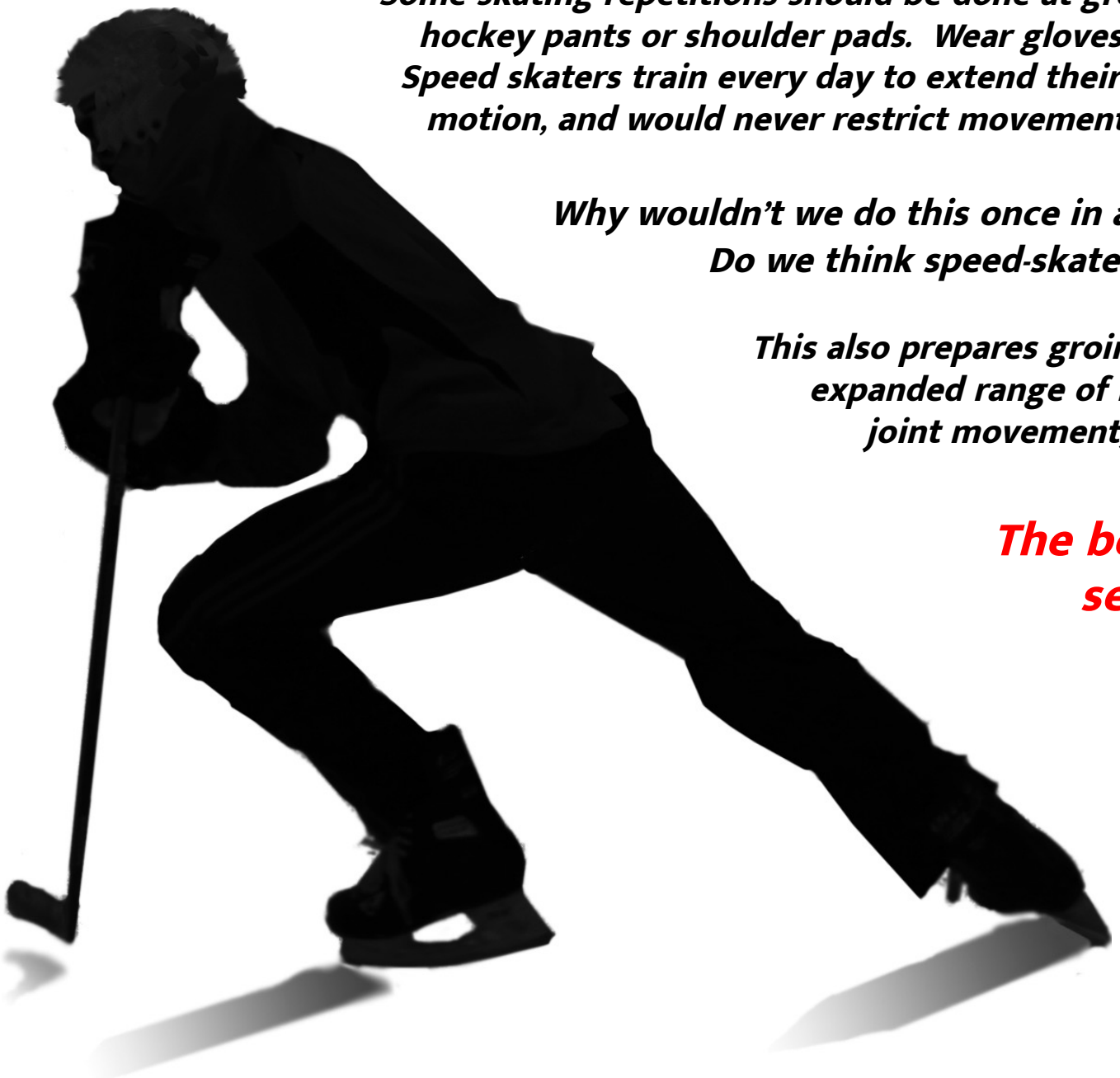




To build athleticism and Core stability
create a variety of Combative drills with unstable base

This one created by Curtis Brackenbury (right),
a former professional player, and now a sport-scientist

OverSpeed Skating Wearing Less Equipment



Some skating repetitions should be done at greater speed without hockey pants or shoulder pads. Wear gloves, elbow & shin pads. Speed skaters train every day to extend their speed and range of motion, and would never restrict movement with hockey pants.

Why wouldn't we do this once in awhile at Overspeed Do we think speed-skater butts don't bruise?

This also prepares groin-hip muscles for the expanded range of motion and speed of joint movement, preventing injuries.

The best coaches I've seen are masters at challenging comfort zones in every way