Hockey Athleticism:

Accelerate your body!!!

not just a barbell



Put it all together

Hockey Athleticism: a list of its isolated elements

Hockey Athleticism is invariably defined by coaches using three words, "Speed, Quickness, Agility (SQA)." Explosive strength always follows, and Herb Brooks added an important element: **Reactivity,** "Adjustment to unexpected obstacles without losing balance or speed." It's so smooth it barely seems special when a football running back spins off a tackler, or a hockey player jumps over an unexpected hurdle to score.



Photo by Tom Dahlin for Benilde-St.Margarets School

But Athleticism is not expressed as isolated elements; it is a Synergistic Symphony of Movement …

… when all the cells of the body work together to produce speed-skill-strength at its coordinated best.

It is naive to think we can develop athletes like Larry Fitzgerald, Lebron James, Alex Ovechkin, or the Cheetah by training each piece separately. Some folks even approach development by strengthening muscles electrically – skipping the complicated learning process within the CNS that coordinates & modifies movement.

Athleticism is so much more than strong muscles.

But isolation is the trend today: core muscles isolated; slow-cardio-aerobic fitness isolated from speed and strength; stationary balance or static flexibility lying on a mat?

Why is this isolationist approach so popular?
It's simple …
there's an 'expert' to teach each piece for a fee.

To develop athleticism we must put it together – like the Cheetah.
Turn weight rooms into speed gyms.



Photo by Phillip Wright
Lebanon, Ohio

The greatest athletes were (are) the best <u>combination</u> of skill & athleticism.

Michael Jordan was not necessarily the best jumper in BB history; although anyone who saw him play thought he could hang in the air forever. He was a great shooter, but there have been better; a great passer with tremendous vision, but perhaps not history's best. He wasn't the quickest of all time or most agile, but these were also major assets.

Few doubt he was the best *<u>combination</u>* of all these qualities.

The same could be said for the best hockey players.

What we also know about great athletes is they were not funneled into specialized programs at early ages as children are today. They integrated athletic skills early as the Cheetah does.

Their development was much more a product of the hours spent in unstructured play on the pond, than lessons learned from a specialist. Diverse sports activities were essential in development.

I watched Larry Fitzgerald play high school basketball, and his athleticism as a wide receiver today looks a lot like athletic skills he developed in basketball.

Putting it together throughout childhood prepares the nervous system to handle diverse, chaotic, reactive athletic movement in later stages of development.



Synergy

The whole is greater than the sum of individual parts.

Nowhere is synergy more apparent than in the combination of speed, strength, rhythm, balance, and core strength of elite athletes. The greatest athletes are the greatest combination of the pieces, not necessarily the best at any one piece.

After a golf tournament, Phil Mickelson spoke to reporters about *synergy* without using the word.

> ***"I feel like I'm doing a lot of things right, but the results don't show it. The PARTS feel better than the WHOLE right now."***

Next week, Phil was smiling. *"Things came together,"* he said, and his win looked easy to viewers. His body functioned like a finely tuned orchestra.

That is why the best development for young athletes is to put the pieces together, and for children this means PLAY a variety of sports, much of it without adults in charge.

– Like a young Cheetah

Putting it together



Speed
Quickness
Agility
Explosive strength
Dynamic balance
Coordination
Core synergy
Reactivity
:

And … Endurance is the maintenance of all this for an entire game.

Hockey Athleticism: ***in this interval reaction drill, Molly Engstrom prepares for the random quickness/agility/reactions in the Winter Olympics.***

Developing SYNERGY among all elements of athleticism:

speed, strength, proprioception, coordination, core stability, dynamic balance, etc.

The first clue is Post-Activation (PAP).

PAP…is an explosive movement (jump, sprint, skate, etc.) that is enhanced above a normal range, because it follows a similar maximal strength or weighted jump set and adequate rest.

The initial maximum effort is called a stimulus set.

That sequence: **(Stimulus set + rest + Explosive sprint or jump set, then repeat).**

In this book we call this a Superset *(**but** the term 'superset' is used for other training, not just PAP).*

Why does PAP work? The physiological mechanism(s) are still being investigated, but center around two processes: phospho rylation in the contractile elements of the muscle, and/or the pattern of excitement, recruitment and firing of nerves within the spinal cord (*for review or in-depth information see Hodgson,2005; Tillin,2009; Behm,2004; Hamada,2003; Horvath,2010. Note that some authors reported no PAP effect, most likely because there is a delicate balance between the timing of potentiation and fatigue after a maximum stimulus set*).

PAP works … if conditions are right!

Science moves slowly, so before research is able to give us all the details to plan workouts, coaches should experiment. Watch to see how a given Stimulus, or different rest intervals affect each athlete. Some will fatigue while others have more spring in their jumps from the same rest/recovery.

Experimentation is in the coaches' corner.

'Potentiation' means the stimulus and rest worked, and the explosive set is greater.

'Fatigue' is just the opposite. Rest might be inadequate or Stimulus is too exhausting.

***Helpful hint for your gym:* In a few seconds an athlete can determine if (s)he has recovered. Keep an old-fashioned vertical jump board on the wall. We care only about the height (s)he reaches on the jump. There is no standing reach measured. When athletes can jump to their previous max height they are adequately rested for quality reps to follow.**

Complex Supersets: Inside or outside

1) Stimulus: Maximum strength – 100% acceleration, not maximum weight;

2) Active rest – could do a core exercise;

3) Explosive jumps – Max Acceleration. Arms free to swing vigorously.

Concentric squats **or** ***Weight vest jumps***

then … arms-free jumps





Is Post Activation Potentiation just a theoretical ivory-tower concept?
Research and anecdotal evidence are compelling.

Coaches have found Post Activation Potentiation to be very successful. Example: Two years in a row different players who trained with us, using this format in preparation for the NHL Combine tests – each increased vertical jump about 6 inches in eight weeks, and were among the top two jumpers of the 100 NHL prospects at the Combine.

It is not realistic to think this magnitude improvement could be expected every time in 8 weeks of any kind of training. These two athletes were super-motivated and had only average vertical jumps for Combine players before the training. They were exceptional athletes and went on to college and AHL careers.

Janz, Dietz, and Malone *(2008)*, wrote an excellent review of different ways to train for explosiveness. Part of the review discussed the value of (Olympic) Weightlifting for this purpose. The second part outlined the success of 'contrast' or 'complex' training, which is alternating between strength exercises and explosive drills. We have referred to this as 'Supersets'.

On-ice PAP

Matthews, Comfort, Crebin (2010) trained and tested 23 year-old English National League players on the ice. They reported a 2.6% improvement in 25m skating sprint times after training with PAP super sets on-ice. Training included a 10 second heavily resisted skating sprint as a stimulus.

How significant is a 2.6% improvement? If an average NHLer improves on our test by 2.6%, he would pass up 30% of the NHL.

Note: I do not advocate, resisting the skating stride any more than hitting golf shots with a weighted club or pitching a heavy ball. The modified timing and coordination are not habits we would choose.



In dryland training the harness should be worn on the shoulders to promote maximum Lean + Straight Line Xtension.

If worn at the waist it encourages habits of an inefficient PIKE posture.





Post Activation Potentiation works.

It's the coaches' duty to balance the rest-recovey against the training history of the player

Tillin NA, 2009.
Sale D, 2002.

çaution ***One-legged jumps must wait for maturity and strength so athletes can land without collapsing the butt toward the heel. Watch for this with 2 legs.***

PAP Superset: contrast training

1) **Stimulus example: One-legged strength or jumps, Weighted lunges, Squats, Dip Squats, StepUps, or Weighted One-legged jumps for elite arhletes.**
2) **Short rest**
3) **Explosive movement!!! Unweighted, Arms-free.**
4) **Repeat.**



Weighted





Squat-JumpToss

A variety of random stimuli in training is the best preparation for the chaos of competition.

Sample superset:

3 weighted squat jumps first; toss on the third; then rest 40s. Follow with a set of unweighted squat jumps (5x) or short sprints (3x)

You will see remarkable improvements in vertical jump

Are jump & sprint improvements associated with increased acceleration on the ice?

Yes. Every time we've tested that premise.

There are too many deficiencies with weight training alone. So every phase of the off-season should combine functional strength training with dynamic body movement.

What does that combination look like?

Better ask a cheetah.



Superset: Squat Jump-Toss + Sprints

3 jumps, Toss on the last one; then two 12m sprints; rest while walking back. Down a very slight hill in this set.

Olympic women improved speed and agility in three months of training using superset workouts.



Move your Body Downhill, Uphill, Side-to-Side, Etc ...







Explode on each jump!!!

For jumps to recruit Fast Twitch muscle fibers, effort must be 100%.

This 'teaches' the nervous system to recruit more motor units, meaning you will improve skating speed, quickness, and agility.

During adolescence the top priority is always the nervous system – not hypertrophy of muscle – because the nervous system is growing and refining faster than it will the rest of your life.



***A**bduction **R**otation **X**tension*

is not a priority in many college weight rooms, even though it's the major key to power in the skating stride.



It's both <u>Range</u> & <u>Speed</u> of movement. It is not sufficient to simply strengthen abductor muscles (glutes) slowly. The movement must be explosive (most of the reps) as in jumping, sprinting – uphill, downhill, flat surface.



Olympians, PeeWees, NHLers

Short sprints (plenty of rest) uphill or on level ground are important at every age and every time of year.

Besides quickness, they increase resistance to hip flexor injuries.



The ultimate integrated training is playing dynamic sports!

Each exercise has its limitations

Therefore, it's best to use a variety of explosive exercises. Some are slow, others very fast; some ranges of motion are more like skating than others, so a variety is best.

Sprints and jumps were highly related to skating with every team we tested. Strength is an important base for training. But no relationship has been found to skating. Why?

Barbell weight training is limited in ways that skating, sprinting, and jumping are not:

- ***Natural arm swing is critical for athletic explosiveness. But arms do not learn to multiply leg force while holding a bar.***
- ***Coordinated force development between upper and lower body must be learned at young ages while the nervous system is expanding and refining.***
- ***In all weight training, the bar travels in one plane only. Hockey movements are not limited this way. Every joint moves in every range of motion.***
- ***The heavier the lift, the slower the acceleration, just the opposite of our target.***
- ***There is deceleration to zero velocity in the last part of every lift, Just where skating requires acceleration.***
- ***Explosive (fast) abduction is not possible with heavy weight training, yet, abduction is the Central base of skating power.***

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I point out some limitations of weight training, but I believe squats and some lifts are important for Hockey, so the best development combines strength training with natural explosiveness: jumping and sprinting.



Gigi Marvin prepares for Olympic Gold

Quickness, core stability, and speed-endurance are built from this interval drill to chase eight rapid fire shots from the coach, then returning – anywhere but to the coach.

Incorporate Supersets <==> Build 'Speed gyms.'

Strength training contributes to athleticism …
but strength can be developed in many ways – some outside the weight room.

One-Leg Weighted Squats, unstable base

These are very intense, and should not be used in the spring until you've done at least a month of strength training, plus two-legged squat jumps, and one-legged squats w/o jumps. It's an excellent stimulus, but the loaded eccentric contraction cause sore hamstrings, so introduce gradually.

Weaker children should NOT do one-legged squat jumps … even without weight.



Brooks Laich training in the Capital's gym



Alternate-Leg Jumps

There is almost no width, so he'd land within this photo.

The main learning point: Elevate the head to practice the kinesthetic feeling of Straight Line eXtension.

SLX at the end of each stride is one key to the 'effortless' speed of the top NHL skaters.

Their force is used efficiently.

At any age, a race with your older brother is one of the best ways to improve skating acceleration.

Stagger the start, so you end up at the finish line at the same time.



Two different sprint starts for skating practice

You almost NEVER start from a standstill in a hockey game, so the word 'start' is a misnomer.

We are preparing for the first stride to accelerate from coasting, changing directions, or any situation where you decide to increase speed.

Crossover start

shown at right

Lean patiently + Straight Line Extension of your body (SLX) ... then use an explosive thrust with the <u>LEFT</u> leg in this case.



Skating start with abduction rotation extension

This is like every skating stride except a cross-over stride (on the preceding page).

EXPLODE with the <u>RIGHT</u> leg, like a jump.

It is not the fastest way to sprint, but this is skating practice.

One long, explosive stride, then sprint normally.



Skating Start Sprint 1,2,3

Face sideways as you would on skates.
First step: Hip Abduction-Rotation-Extension
like every skating stride



1 Start by standing 3' in front of starting block

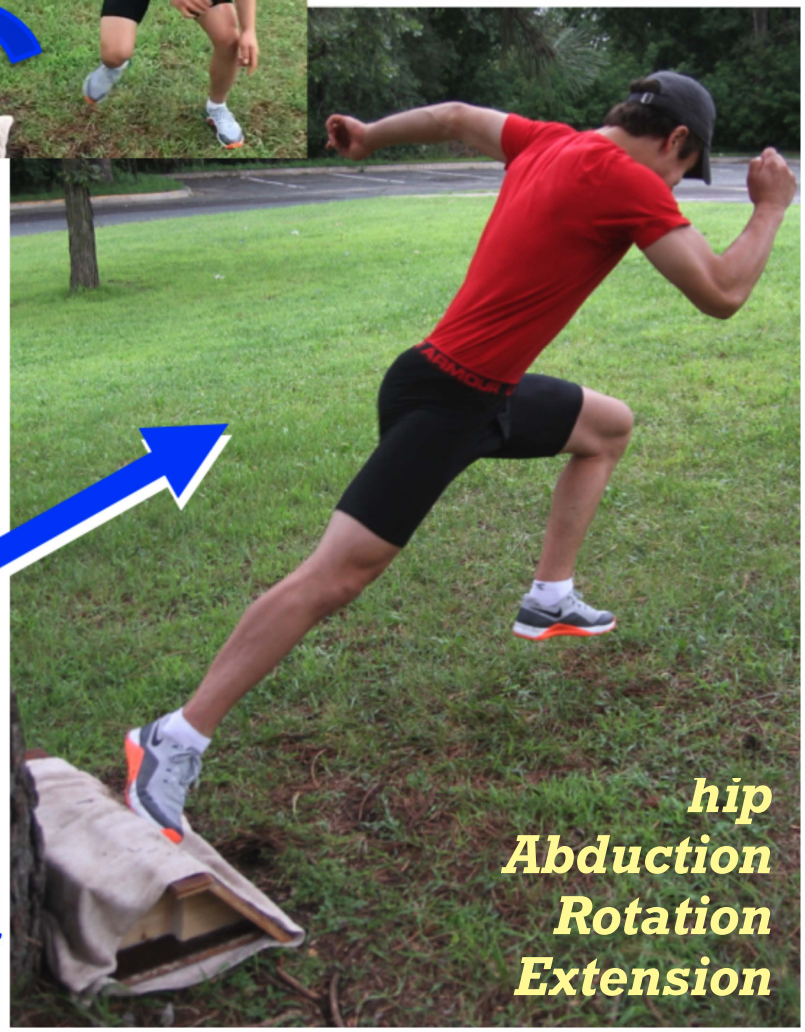
2

2) Recoil back to block



3

3) Explode with great Force (jump) on your first sprint step







The theme throughout this book is: put it all together.

Whether testing or training, restricting arms eliminates athleticism!
Why do we do that?

Maybe cheetahs are smarter than we are.

The words 'Force' and 'Power' are often confusing in training for Speed, Quickness, Agility and Explosive Strength.

Force is used correctly, but can be misleading (as we will discuss shortly).

Power has many colloquial uses. The graph on the next page shows a correct use.

Power = Speed x Acceleration of your body mass *(using functional every-day language.*

Example1: *explosive acceleration from a standstill is a different topic than power. Training for both is important.*

Example2: *a force platform might tell us that when we do heavy squat jumps with about 1/3 of our maximum squat, we are training for maximum power. But we know a video would show that we're moving slower than if we jumped with just body weight. If speed of movement is a goal, then power may not be a training priority.*

Example3: *skating instruction should use a different name than 'power skating' if it doesn't lead to greater speed and/or acceleration, which are the two essential elements of power.*

Given the multitude of different 'expert' opinions (some good; some bad) and the carelessness of scientific reporting, it is no easy task to plan your training during the crucial teenage years. But ...

The important question is:

how do I train to accelerate my body?

The word 'Power' can be misleading

When a Sprinter explodes out of the blocks, the first steps are the greatest acceleration (or force). The greatest power occurs at higher velocity, because

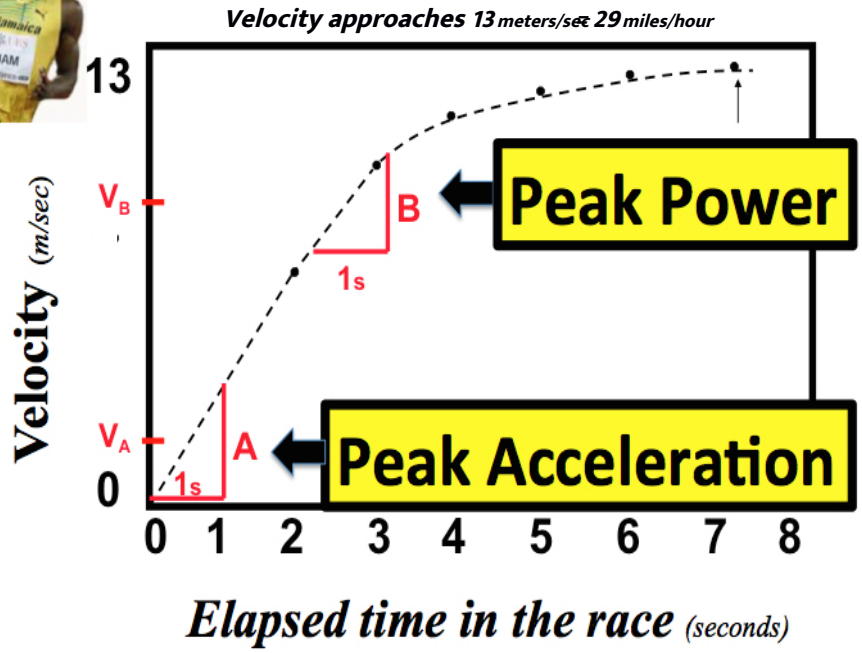
Power = Force ¥ Velocity of your mass.

Another way to look at it:

A car needs more power (fuel/second) accelerating from 55 to 60 mph, than from 5 to 10 in the same time.

The graph shows Usain Bolt's velocities as he accelerates to top speed at about 7 seconds





Power (Force•Velocity of his body) is greater at B, because velocity is much greater.

Note: the graph is not intended to show earth- shattering information, only that Power and acceleration are not the same thing.

So, training for Power is different than for explosiveness out of the blocks. Not less important, just different.

Example **Bursting from 80-100% to beat the D**

Visualize this race: at 3 seconds a cheetah reaches 75mph. That is 3x Bolt's acceleration ... the fastest human in history Where on the graph? Above the word 'fuel' on this page. !

Does the word 'Force' mean that strength training must be in a weight room?

No!!! *Note:* ***Force = mass x acceleration … (F=m•a)***

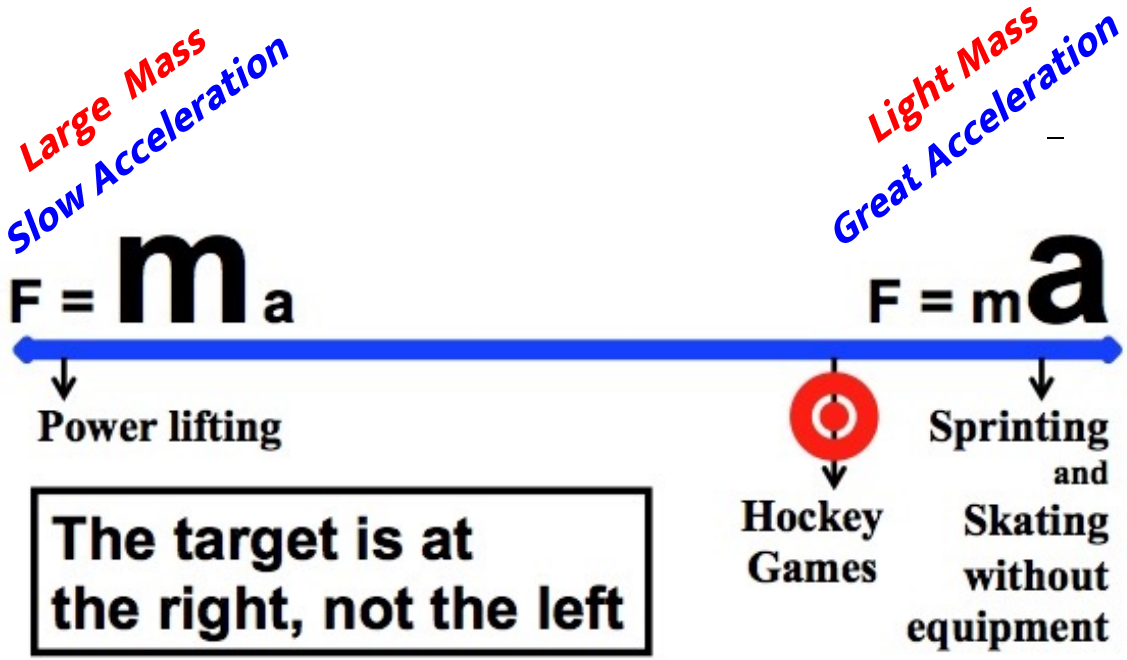
A) **When we see the word 'acceleration' we correctly think 'Force.'**
To many strength coaches "Force" automatically means adding great MASS to the bar (left end of the continuum below). Keep in mind the goal is "a" (acceleration – right end of the continuum).

B) **But, the more mass used in training, the slower the person's body accelerates.**

C) **Neuromuscular learning occurs with each rep, and results are specific to the *speed* of training.**

Slow strength training is not wrong ..... just incomplete!

It results in fast performance only if combined with fast training.



Integrate fast acceleration of your body into strength workouts.

If you want to improve 'Quickness' or 'Explosiveness,' such as the first few steps of a race for the puck … train to Accelerate your body.

Sprints accelerate your body not a barbell.

Olympic lifts (Clean-Jerk and Snatch) have been promoted ***as*** *the most 'powerful' strength exercises. They might be … when power is measured from a force platform, and includes force required to move the bar+athlete.Video shows the* ***bar moves explosively, but the*** *athlete's center of mass moves* ***only a*** *short distance –* ***not very fast*** *–* ***and*** *nothing like a hockey game.*

Accelerating your body is the goal in dryland skating practices.



Some related research follows

Johnson, Salzburg, and Stevenson (2011) reviewed seven studies, related to the efficacy of plyometric training of young children (ages 5-14 years-old). They concluded that plyometrics are very effective for improving sprinting and jumping.

Using 18-22 year-old college subjects, Delecluse and co-workers compared the effect of 9-weeks (2x per week) of Strength Training or high-velocity (Plyometric) training on three parts of a 100m sprint: acceleration to 10m; acceleration from 10-36m; and maintenance of top speed after that. Subjects also did a sprint workout once a week, while a second control group did no training for the 9-weeks.

Analysis for the sprint test utilized a 'Velocimeter,' (a nylon wire and spring-loaded wheel attached to the subjects' lower back, collecting 1000 data points in 100m).

The plyometric group improved vertical jump, broad jump, and the first two acceleration phases of the sprint (and the overall 100m time) more than the strength trained group or either control group, ($p<0.05$). The strength trained group improved initial acceleration for 10m compared to the control group that didn't train at all.

Janz, Dietz, and Malone *(2008)*provided a more thorough review of research on this topic, concluding that both (Olympic) weightlifting and plyometric training are effective.

Sprint and Jump improvement from plyometric training was reported in a recent literature review by Bedoya, Miltenberger, and Lopez *(2015)*. They reviewed seven studies (published 2000-2014) investigating the effects of plyometric training to supplement youth-adolescent soccer practices. Plyometric training varied in content and frequency from study to study (1-3 days per week). But in each study Plyometric training resulted in significant improvements in sprinting and jumping.

On the other hand, Chaouachi and co-workers *(2014)* studied 11-year-old boys (n=63) to compare three different training modalities: Olympic Weightlifting, plyometric training, or traditional resistance training (RT) for 12 weeks, 2x per week. They found greater improvement in vertical and horizontal jump tests with the group that trained using Olympic Weightlifting. Resistance training increased sprint capabilities more than the other two training modalities. Both the Olympic and traditional weight training used progressive overload strategies throughout the 12 weeks, and weight was added to the bar on an individual basis. In the RT group, subjects lifted to fatigue (failure) in each set. Progression of this kind, using measurable standards, was not implemented for plyometric training, and might have led to its ineffectiveness to improve jumps or sprints.

The authors emphasized that the the two groups lifting weights needed coaching, while the plyometric group did not. I would ask if they have just verified that eleven year-old boys improve more if they are coached? Furthermore, the Plyometrics were nothing like the Squat-jump training recommended for skating. They emphasized "ballistic jumps … executing as forcefully and rapidly as possible."

Rapid execution is not a priority for skating at high-speed (or for 'skating jumps) Impulse is the key, not rushing each stride, but producing maximum force to the side.

The height of a jump is determined by impulse, not power.

{Power = force x distance/time} while {Impulse = force x time}.

Notice that **time** is in the denominator in one case and numerator in the other; therefore, rapid execution increases Power, but not Impulse, meaning rapid execution is not the priority in training for vertical jump height.

Examples: High-jumpers need to increase vertical takeoff velocity. That means Impulse is maximized in order to perform best, so they make no attempt to rush the takeoff stride. Nor could a high-jumper execute with exaggerated slow motion, because high force must be maintained throughout the takeoff. This is also true for skating acceleration.

Maximizing Impulse: Discus and hammer throwers and Shot-putters have developed strategies from centuries of experimentation, to increase the **time** over which they accelerate their bodies in a confined space. Their task is to create the greatest velocity inside the ring, and much of the momentum they achieve is transferred to the discus or shot. If their success were to depend on minimizing time (as in training for Power) their technique would look a lot different.

Skating acceleration depends on Impulse (I = Force x time)

Brief contact time with the ice is not a priority in skating, while sprinters plyometrics emphasize brief contact. So to build explosiveness in your skating stride, do one- or two-legged squat jumps with good knee bend, without rushing! Explode from that position! Elevate your head as high as possible to attain SLX (straight line extension), and use strength efficiently.

Olympic lifts may or may not improve skating speed, quickness, agility.

No evidence has been published to show a relationship, and with several high school, college, and professional teams that included Olympic lifts in their training-testing programs, we found no relationship to skating tests .



There is little question that Olympic Lifts involve complex athletic movements, recruiting a large number of muscles throughout the entire body. However, for young players who must develop hockey skills, competitive rink sense, speed and agility, the investment of time to learn Olympic Lifts safely with significant weight is better spent elsewhere. Why?

1) Explosive lift? The objective for Olympic Lifts is to **MOVE the BAR explosively**, while the athlete's Center of Mass moves very little compared to skating. There is one moment of very quick movement of the body, even though it doesn't move far. This is discussed on the next page.

2) The range of motion from the hips in skating **(abduction–rotation-extension)**, is vastly different than for a clean or snatch. Without abduction the legs are confined to a box.

Leg movement is restricted to a box; skating is not.

3) These are **COMPETITION LIFTS**, not training lifts because the learning curve is too long. Think outside the propagada box. Find exercises that use whole-body, explosive movements, but don't require years to learn. Example next page.

One of the important athletic 'feelings' in the Olympic Lifts is Efficient, whole-body use of Force (Straight Line Extension) … aligning vertical force up from your legs through your center of mass.

I haven't heard anyone use the term, SLX, but Weightlifters emphasize it (Position B, next page) by thrusting the hips forward so the legs are under the bar to apply vertical force to it. It's a long learning curve before handling heavy weight efficiently and safely ….. about as long as learning the golf swing!

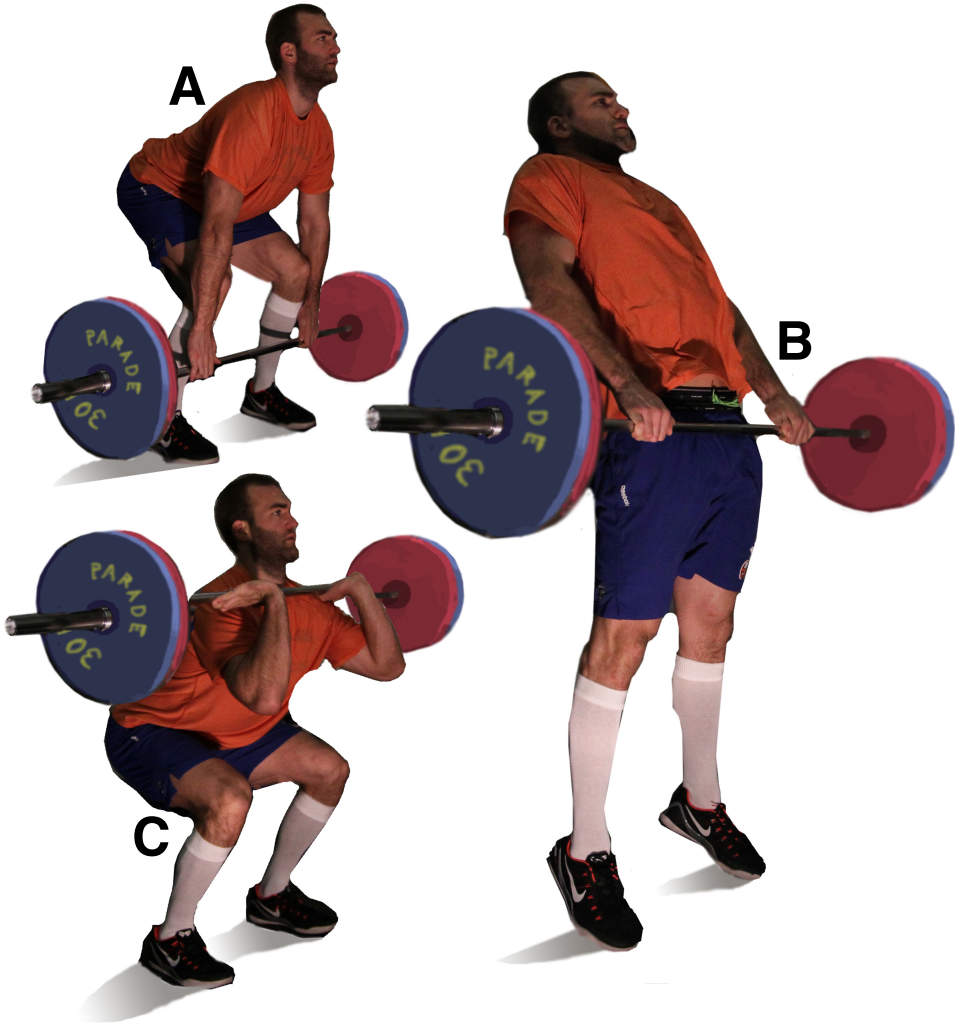
On the other hand, to throw a heavy Medicine ball or PlyoTube (sand bag) as high as possible athletes automatically get their legs under the object (plus body weight) on the <u>first day</u> with no instruction other than, "Use your legs, and throw it as high as you can."

Study the photos on the next page. You will see that the demands of physics are the same, whether you are applying EFFICIENT FORCE under the Olympic bar or the heavy sand bag you must get your legs and hips under the bar.



The difference?

~~Months~~ YEARS of learning!!!



Straight Line Extension (SLX at 'B' and '3')

In cleaning a heavy bar or throwing a weight vertically, you first accelerate your (body+object) with force from the legs (photos 1&2; A&B). Then your momentum is transferred to the object (Photos B & 3).

The difference is the lengthy learning curve.

Squat Jump Throw –>
vs
<- Clean

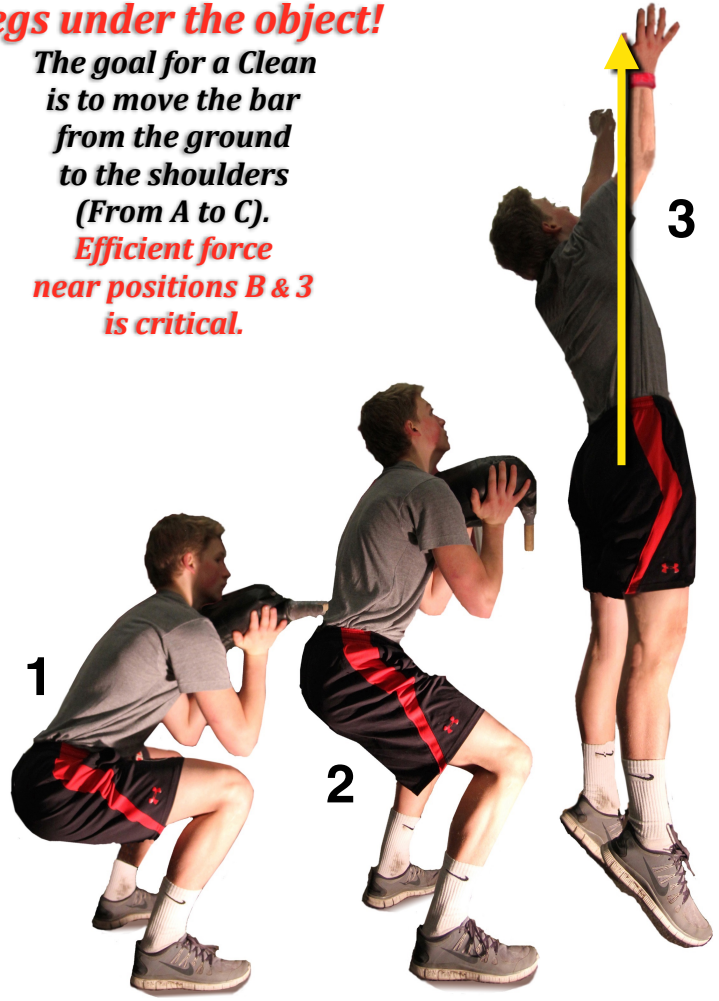


Physics makes the same demand on the thrower as the Weightlifter:

Legs under the object!

The goal for a Clean is to move the bar from the ground to the shoulders (From A to C).

Efficient force near positions B & 3 is critical.



Transferring force from legs to arms

Transferring momentum from your legs to an object is essential for Olympic Lifts, Shot Put, Discus, Golf, or Shooting a puck. In this training exercise (at right), he throws a 12 pound medicine ball 5 feet higher than in the photo.

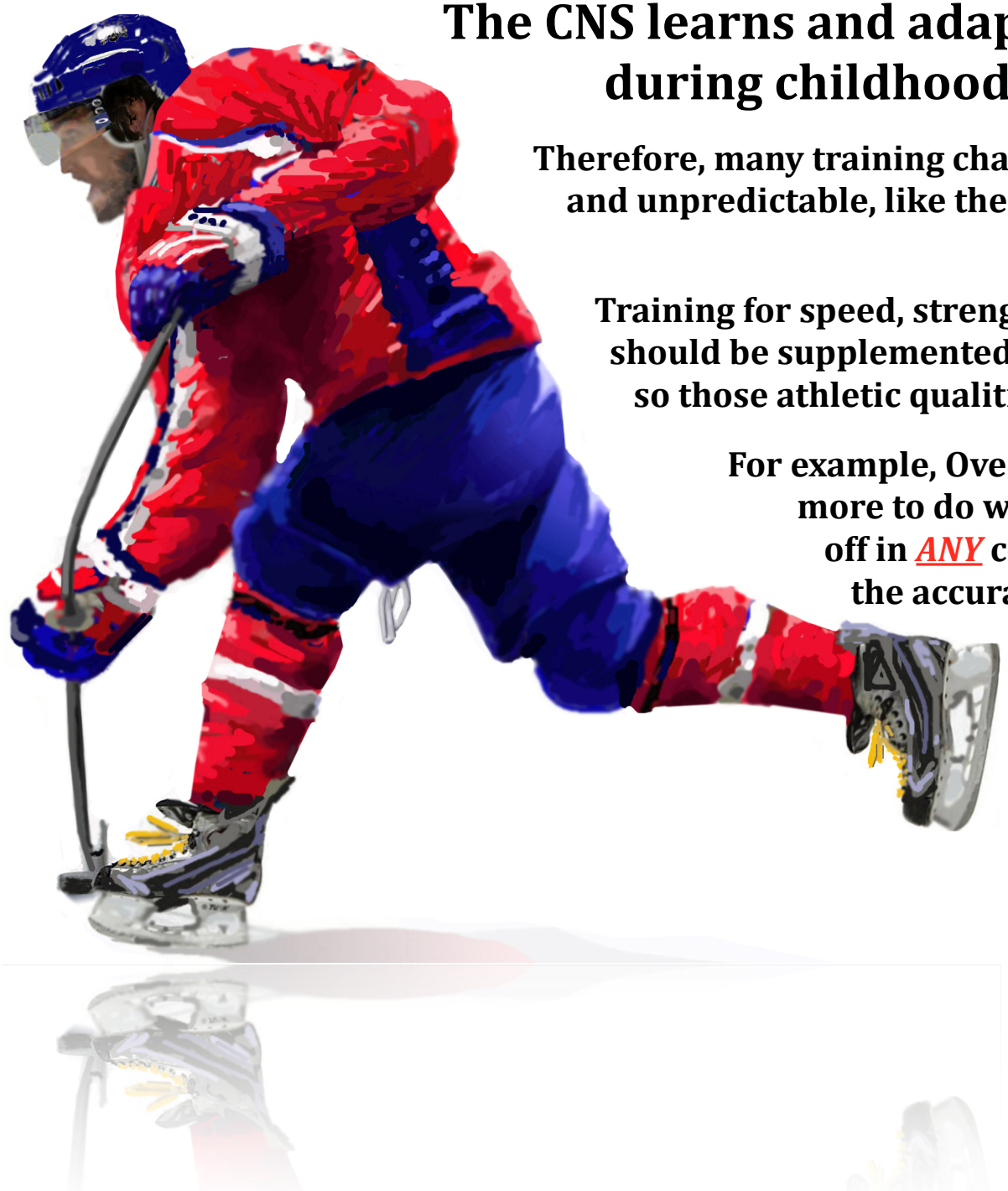
In sprinting, jumping, and skating it's all about efficiency of force to accelerate your body's center of mass. In skating, you do this by abduction-extension from the hips, and extension at other leg joints.

This toss (like a vertical shot put) teaches efficient acceleration of your center of mass by your legs; then transferring your own momentum to the ball. The core must maintain a 'stiff' cylinder in order to transfer this force from the ground to the shoulders *(McGill 2007,2010).*

This momentary stiffness (SLX) is how Rory McIlroy hits golf balls as far as the big guys. It's the same momentum transfer when you shoot a puck.

Efficient application of force and core synergy-stability are critical for skating to ensure your strength is used effectively.





The CNS learns and adapts at a rapid pace during childhood and adolescence.

Therefore, many training challenges should be diverse and unpredictable, like the 'chaos' in a hockey game, or in many other sports.

Training for speed, strength, quickness, and agility should be supplemented with game-like activities so those athletic qualities are effective in games.

For example, Ovechkin's scoring magic has more to do with his ability to get shots off in *ANY* competitive situation than the accuracy or velocity of his shot.

Is that because he learned to shoot-score in competitive practice?

Like a cheetah?

Don't ask what college and pro athletes DO. Ask what they DID as children and adolescents.

What must every young player do in order to compete at higher levels?
Clues to guide your thoughts are found in Adrian Peterson highlights.
https://www.youtube.com/watch?v=8mItf5URwkk

Speed, strength, quickness, and agility are a good start, but the pieces must fit appropriately into the random action of a game.

So the first answer is PLAY. Play other dynamic sports that feature speed, agility, and reactions.

Consider that by the end of his first fall season in college, Peterson was runner-up for the Heisman Trophy. It's not important to know what he and other college or pro athletes DO once they make it. We'd really like to know what they DID as children and adolescents to acquire such elite athleticism.

Peterson played football, basketball & track

Was strength training part of his development? Certainly. But strength is just one piece of a diverse program. Speed is another piece. Basketball, tennis and other sports teach your CNS how to execute those pieces efficiently during competition.

Practices in which skills must respond to competitive obstructions lead to greater development of the CNS than drills that require no random reactions.



Photo modified from REUTERS / Eric Miller

Acceleration? Think outside the box

Why are Cheetahs so darn fast?

1) Cheetahs accelerate to 70 miles per hour in 3 seconds! Yet, they've never read textbook advice telling them that to be explosive, they must train for 'force' and 'power.' **Maybe Cheetahs are fast because they can't read.**

Strength is very important, but by itself, is inadequate to improve speed.

We need to combine strength and explosive training in creative ways. So, blow out the walls of weight rooms, and turn them into 'Speed Gyms,' so we can sprint, if only 5 steps. Add supersets: strength/jump/sprint. Alternate between strength and explosiveness often, but allow the right recovery intervals to avoid diminished quality due to fatigue.

2) In an attempt to improve force and power, if Cheetahs lifted heavy weights and gained excess muscle mass like nose tackles, would they be faster? Or, would they become Tigers, and run slower? Muscle mass is over-rated for some athletes, but it is a very attractive, easy sell to adolescent males. **During adolescence, speed is the top priority.** Sprinting is under-rated, and should be combined with strength/jump training. **But sprints are neglected, because no one makes money saying, "Go sprint."**

3) Do Cheetahs suffer from core instability? After all, they don't isolate core muscles. They just train them in concert with everything else. Is that a good way to create synergy among the various body parts? **Is Synergy the most important factor in developing athleticism? Should we reduce compartmentalized training, and integrate more often?**

4) Young Cheetahs ***PLAY*** and combine the elements of athleticism all the time. Neuroscientists are finding that low-stakes ***PLAY*** at young ages increases the rate of athletic improvement later, because of the diversity of challenges to the Central Nervous System.



Can we learn from Cheetahs?