



20 NSCA 22 *NATIONAL* CONFERENCE

July 6-9, 2022 | New Orleans & Online

#NSCACon22

› *KNOWLEDGE*
› *ADVANCEMENT*
› *COMMUNITY*

CONFLICT OF INTEREST STATEMENT

I have no actual or potential conflict of interest
in relation to this presentation.

Deceleration & Landing: Building The Brakes

Matthew S. Ibrahim
Strength & Conditioning Coach
College Professor
Ph.D. Student

Background



Background



Background



Background

Picture This...



Introduction

Learning Objectives

- **Objective 1:**
 - Build a better understanding of athletic performance skills:
 - Deceleration
 - Force absorption
 - Landing mechanics
- **Objective 2:**
 - Develop sound exercise selection and training program strategies
- **Objective 3:**
 - Review practical weight room and field/ court progressions and regressions

Table of Contents

1. **Force Application:** develop a better understanding of absorption vs. production
1. **The Problem:** review the high rate of lower body sport injuries in the research
1. **Direct Loading:** highlight current views and strategies utilized in practice
1. **Building The Brakes:** demonstrate landing and deceleration as primary skills
1. **Deceleration Training:** explore training applications and programming considerations

Section 1: **Force Application**

Force Absorption

- **Force Absorption:** the body's ability to accept load.
 - Deceleration (slowing down)
 - Pumping the brakes
 - Landing (accepting load)
 - Absorbing force, impact and/ or contact



Force Absorption: Example #1



Section 1: Force Application

Force Absorption: Example #2



Section 1: Force Application

Force Production

- **Force Production:** the body's ability to express power.
 - Acceleration (speeding up)
 - Pressing down on the gas pedal
 - Jumping (harnessing load with intent) ⇒ **Force = Mass x Acceleration**
 - Producing power, explosiveness and/or propulsive capabilities



Force Production: Example #1



Section 1: Force Application

Force Production: Example #2



Force Production: Example #3



Section 1: Force Application

RFA vs. RFD: Which is Better?

- “Research suggests that injuries are typically **correlated with eccentric muscle actions**” (Jeronimo et al, 2016).
- “Since **decelerating based movements typically occur eccentrically**, it is important to attain a **high level of strength and eccentric rate of force acceptance (RFA)** to help prevent injuries” (Jeronimo et al, 2016).



Current Field Focus: Force Production

- Coaches and practitioners: Do we **need** a more well-rounded approach?



Missing Link: Force Absorption

- **Athletic performance skills (“athletic brakes”):**

- Deceleration
- Force absorption
- Landing

- **Foundational building blocks:**

- Long-term durability
- Injury resilience



Critical Appraisal of Our Approach

- Our athletes are fast, strong and powerful, but are they:
 - Healthy for the long-term?
 - Injury resilient?
 - Durable?
- Do no harm:
 - Confident “yes” across the board



Section 2: **The Problem**

Current Evidence: Calf Region Injuries

- “The incidence of acute **Achilles tendon rupture** appears to be increasing” (Yang et al, 2018).
- “Ten studies were obtained for review. Subjects across football, Australian football, rugby union, basketball and triathlon were reported on, **representing 5397 athletes and 518 calf/lower leg muscle injuries**” (Green et al, 2017).
- “Calf muscle strain injuries (CMSI) are common across sports involving **high-speed running or high volumes of running load, acceleration and deceleration, and upon fatiguing conditions** of play or performance” (Green et al, 2017).

Current Evidence: Hamstring Region Injuries

- “Hamstring strain injury (HSI) is one of the most commonly reported sports injuries” (Wing et al, 2020).
- “The reported prevalence of hamstring injuries in various codes of soccer, to which most literature pertains, is generally 8% to 25%, with each injury resulting in a 2 - to 6 - week sporting absence” (Prior et al, 2009).
- “Current evidence suggests that a professional male soccer team with 25 players would suffer about five hamstring injuries each season, equivalent to more than 80 lost soccer days” (Askling et al, 2013).

Current Evidence: Groin Region Injuries

- “In professional ice hockey and soccer players throughout the world, **approximately 10% to 11% of all injuries are groin strains**” (Tyler et al, 2010).
- “Seven trials were included: six on football players (four male and two female populations) and one on male handball players. **In total there were 4191 participants with a total of 157 groin injuries**” (Esteve et al, 2015).
- “Physiotherapists allocated to each of the participating 44 soccer clubs recorded baseline characteristics and **groin injuries sustained by a cohort of 998 sub -elite male soccer players during a full 10 -month season**” (Holmich et al, 2013).

Current Evidence: Knee Region Injuries

- “Acute strain injuries of the **quadriceps commonly occur in athletic competitions** such as soccer, rugby, and football” (Kary, 2010).
- “We have documented 17,397 patients with 19,530 sport injuries over a **10-year period of time. 6434 patients (37%) had 7769 injuries (39.8%) related to the knee joint. Almost 50% of the patients were between the ages of 20 –29 (43.1%) at the time of injury**” (Majewski et al, 2006).

Incidence of ACL Tears – 2012-2020

Year	Preseason			Regular Season			Preseason + Regular Season		
	Practice	Game	Total	Practice	Game	Total	Practice	Game	Total
2012	13	16	29	5	28	33	18	44	62
2013	15	11	26	3	32	35	18	43	61
2014	12	10	22	0	27	27	12	37	49
2015	13	16	29	5	25	30	18	41	59
2016	9	11	20	7	29	36	16	40	56
2017	15	16	31	2	21	23	17	37	54
2018	10	18	28	5	24	29	15	42	57
2019	7	10	17	7	25	32	14	35	49
2020	11	N/A*	11*						

Injuries, ACL tears reported as primary diagnosis. In the case of a single injury event, result in torn ACL, then ACL tear is the primary. These injuries are counted in seasonal ACL and MCL totals. An ACL tear that occurred during a game is counted in game totals.

*2020 preseason games were omitted due to the impact of COVID-19.

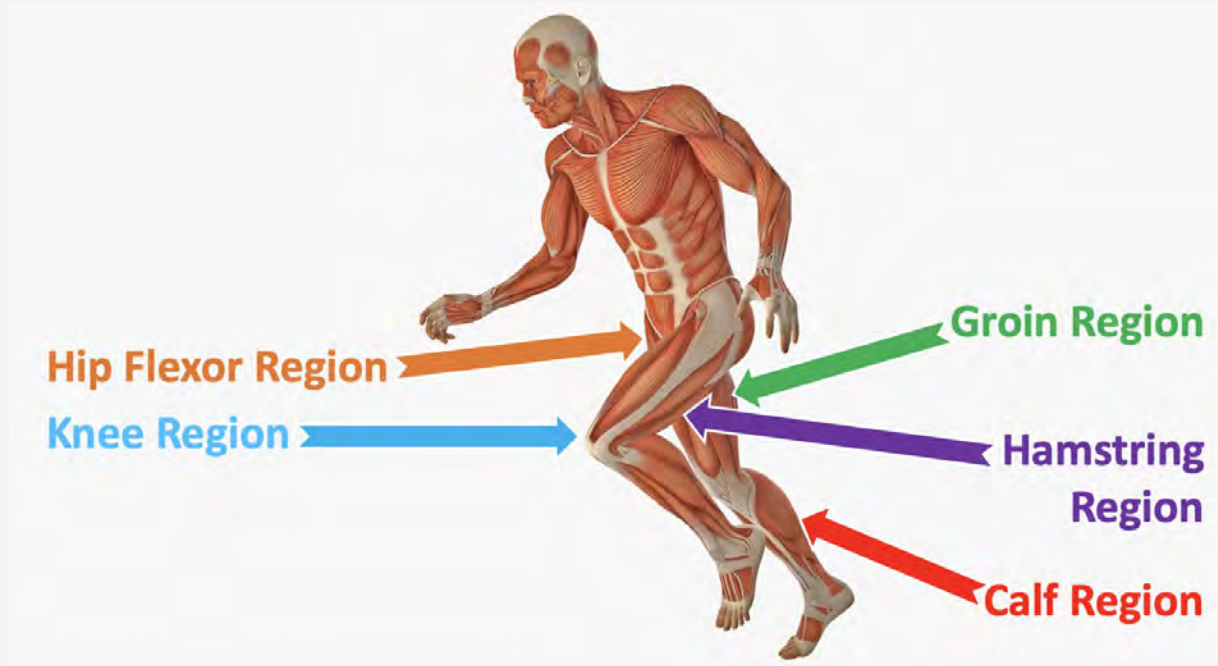
<https://www.nfl.com/playerhealthandsafety/health-and-wellness/injury-data/injury-data>

Section 2: The Problem

Current Evidence: Hip Flexor Region Injuries

- “Hip flexor injuries account for **one-third of acute groin injuries**” (Serner et al, 2018).
- “A total of **770 hip flexor and 621 hip adductor strains were reported, resulting in overall injury rates of 1.60 and 1.29 per 10,000 athlete-exposures (AEs)**, respectively” (Eckard et al, 2017).
- “Athletic injuries to the **hip flexors and iliopsoas have been described in populations across all levels of competitive sports**. Overall estimates of hip flexor pathology have ranged from **5% to 28% of injuries among high-risk sport specific groups**” (Christopher et al, 2021).

Key Areas: The Big 5



Are These Primary Exercises Enough?

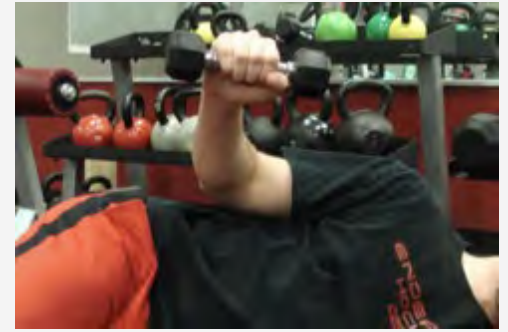
- “But, we have our athletes..[**insert exercise**]”
 - **Bilateral:**
 - Knee Dominant (Squat)
 - Hip Dominant (Deadlift, RDL and Hip Thrust)
 - **Pseudo Unilateral:**
 - Knee Dominant (Split Squat and Kickstand Squat)
 - Hip Dominant (Kickstand: Deadlift, RDL and Hip Thrust)
 - **Unilateral:**
 - Knee Dominant (1-Leg Squat and Step-Up)
 - Hip Dominant (1-Leg RDL and 1-Leg Hip Thrust)



Section 3: **Direct Loading**

Training for Baseball Performance

- “Arm care”
- “Shoulder health”
- “Direct arm work”
- “Volume and load management”



Are We Afraid to Isolate Lower Body Regions?

- Training programs birds eye view:
 - How often are you targeting these key regions in an isolated manner?
 - Calf
 - Hamstring
 - Groin
 - Knee
 - Hip flexor



Training for Complete Athletic Performance

- “Arm care and leg care”
- “Shoulder health and [insert region] health”
- “Direct arm work and direct [insert region] work”
- “Volume and load management”

Calf
Hamstring
Groin
Knee
Hip Flexor

Importance of Direct Loading

- Makes for a more **complete** training program
- **Reduces** likelihood of lower body injuries:
 - ↑ Tissue tolerance (loading capacity)
 - ↑ Tendon health for relative stiffness
 - ↑ Localized strength for global contribution
 - ↑ Eccentric loading competence



Load Tolerance and Capacity

“It’s *not* the load that breaks you down;
it’s the load that you’re not prepared for .”
– Dr. Tim Gabbett



How Do We Target Directly?

-  Time under tension:
 - Isometrics (holds)
 - Eccentrics (controlled descent)
 - Tempo work (i.e., 3s/ 3s/ 3s)
 - Full joint excursions



Direct Loading - Calf Region: Example #1

- “The triceps surae, made up of both the gastrocnemius muscle and soleus muscle, **responds robustly to regimented exercise**” (Schoenfeld et al, 2020).
- **Gastrocnemius muscle** ⇒ prioritize standing positions ⇒ on slack in bent knee (seated) positions ⇒ crosses ankle joint and knee joint

[DB Standing Heel Raise](#)



Direct Loading - **Calf Region: Example #2**



[SSB Hatfield Standing Elevated Heel Raise w/ 5s Ecc](#)

Direct Loading - Calf Region: Example #3

- **Soleus muscle** ⇒ prioritize seated and bent knee positions ⇒ single-joint muscle (crosses ankle joint only)

[KB Seated Elevated Heel Raise \(Tempo: 3s Up/3s Down\)](#)



Direct Loading - **Calf Region: Example #4**

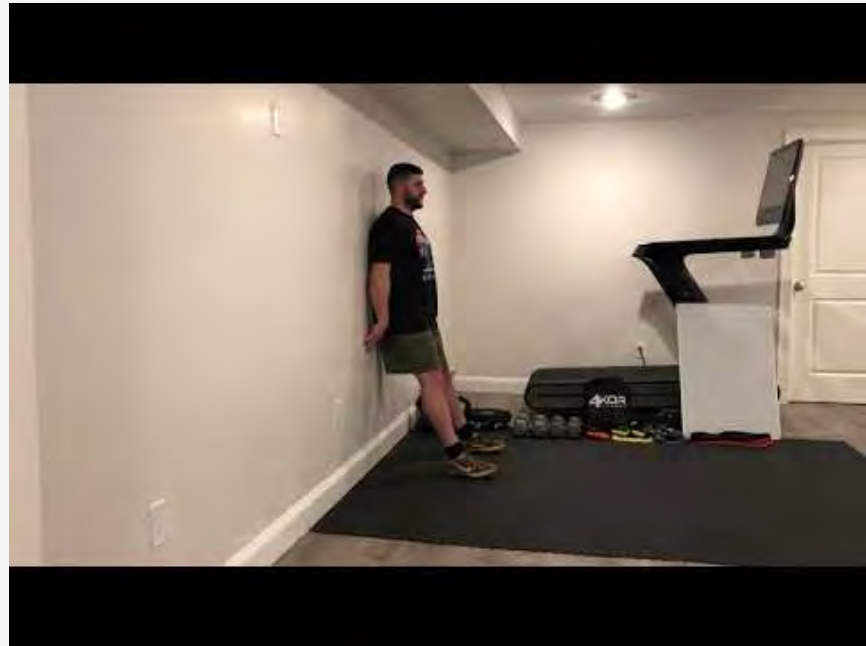


[SSB Hatfield Knees Bent Heel Raise](#)

Direct Loading - Calf Region: Example #5

- “Medial tibial stress syndrome is a **common overuse injury** in jumping and running athletes” (Winters, 2020).

[Wall Toe Raise](#)



Direct Loading - Hamstring Region: Example #1



[Slideboard Hamstring Extension w/ 5s Ecc](#)

Direct Loading - Hamstring Region: Example #2



[Slideboard Hamstring Curl](#)

Direct Loading - Hamstring Region: Example #3

- “Reduction in the overall injury risk ratio of 0.49 in favor of programs including the **Nordic Hamstring Exercise (NHE)**, which may increase fascicle length, leading to morphological changes that may protect the hamstring muscle from injury” (van Dyk et al, 2019).

[Nordic Hamstring Drop w/ 5s Ecc](#)



Direct Loading - Hamstring Region: Example #4



[Razor Hamstring Extension w/ 5s Ecc](#)

Direct Loading - Hamstring Region: Example #5

- “The **Glider (L -3)** from the **Askling Hamstring Protocol** has been used to successfully support strength and durability with an emphasis on eccentric loading of the hamstrings during maximal dynamic lengthening, which is an attempt to mirror situations in athletics that commonly lead to injury” (Askling et al, 2014).

[TRX Slider 1-Leg Hamstring Reverse Glide](#)



Direct Loading - Groin Region: Example #1



[MB Floor Knees Bent Copenhagen Plank](#)

Direct Loading - Groin Region: Example #2

- “One study found that the use of the **Copenhagen Adduction (CA)** demonstrated a reduction in groin problems by up to 41% during in-season participation” (Polglass et al, 2019).

[Copenhagen Plank \(Long Lever\)](#)



Direct Loading - Groin Region: Example #3



[Knees Bent Copenhagen Plank w/ 3s Ecc](#)

Direct Loading - Groin Region: Example #4



[Copenhagen Plank w/ 3s Ecc \(Mid Lever\)](#)

Direct Loading - Groin Region: Example #5



[KB Front Rack Slideboard Lateral Lunge](#)

Direct Loading - Knee Region: Example #1

- “Identified modalities for **eccentric loading in athletic populations** involve classical isotonic exercises, accentuated jumping exercises, **eccentric overloading exercises**, and eccentric cycle ergometry. We conclude that eccentric exercise offers a promising training modality to enhance performance” (Vogt et al, 2014).

[Hands Supported Kneeler](#)



Direct Loading - Knee Region: Example #2



[Band Resisted Hands Supported Kneeler](#)

Direct Loading - Knee Region: Example #3

- “The **Reverse Nordic Hamstring Exercise (RNHE)**, better known as the Reverse Nordic Curl in performance circles, has been shown to produce a significant increase in the muscle fascicle length, muscle thickness, pennation angle, and cross-sectional area in the quadriceps muscles” (Alonso-Fernandez et al, 2019).

[Tall Kneel Fallback](#)



Direct Loading - Knee Region: Example #4



[DB Goblet Tall Kneel Fallback w/ 5s Ecc](#)

Direct Loading - Knee Region: Example #5



[DB Goblet Band Spanish Squat](#)

Direct Loading - Hip Flexor Region: Example #1



[1-Leg Bridge Iso w/ Manual Hip Flexor Iso](#)

Direct Loading - Hip Flexor Region: Example #2



[Hands Supported Half Kneel Lift](#) -Off Iso

Direct Loading - Hip Flexor Region: Example #3



[Band Resisted Floor Long Sprinter Iso](#)

Direct Loading - Hip Flexor Region: Example #4



[Band Resisted Floor Long Sprinter](#)

Direct Loading - Hip Flexor Region: Example #5



[Band Resisted Hands Supported Sprinter](#)

Section 4: **Building The Brakes**

What Does 'Deceleration' Mean?

- Quick review:
 - Deceleration: slowing down
- Let's take it a step further:
 - **Deceleration:** demonstrating body control and self-organizing when changing speeds (speeding up to slowing down) in a *fast* and *controlled* manner.



What Does 'Landing' Mean?

- Quick review:
 - Landing: accepting load
- Let's take it a step further:
 - **Landing:** demonstrating body control and self-organizing when accepting load and absorbing force upon impact in a *fast* and *controlled* manner.



Tesla Cars

- Premium, high-quality cars
- “**Brake pads** on Tesla cars would literally never need to be replaced”. – CEO, Elon Musk



Athletes

- Be the **Tesla of athletic performance**
- Speed is worthless without a durable, long-lasting set of brakes



Luis Mendoza, Ladies & Gentlemen



Current Literature

- “A training program including **jumping and landing exercises** with male and female basketball players **can be effective in preventing lower extremity injuries**” (Aerts et al, 2013).
- “The inclusion of a program centered around **jumping and landing exercises could improve jump -landing technique, which would help to reduce the risk of lower body injuries**” (Root et al, 2015).
- “An injury prevention program including standardized **jump -landing tasks can reduce vertical ground -reaction forces** and may need to be performed constantly in order for participants to maintain the **protective effects against injury**” (DiStefano et al, 2016).
- “**High levels of eccentric strength are required in tandem with appropriate training of deceleration technique** specific to sporting performance” (Hewitt et al, 2011).

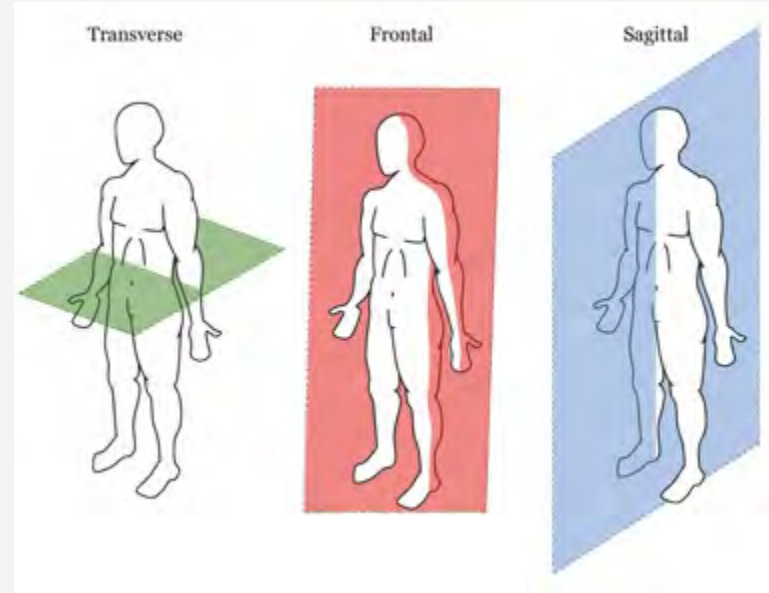
Skills & Qualities

1st Order of Business	2nd Order of Business
Deceleration	Acceleration
Landing Technique	Jumping Technique
Force Absorption	Force Production

Section 5: **Deceleration Training**

Planes of Motion

- **Sagittal Plane:** forward and reverse movements.
- **Frontal Plane:** side-to-side and lateral movements.
- **Transverse Plane:** rotation and twisting movements.



Primary Goals: Weight Room

- Feel the ground underneath you
 - Body control and self-organize
- Land with intent and purpose
 - “*Land softly*” – to do or not to do?
- Sports occur at high speeds, various angles, and in violent/aggressive manner
- Gradually increase eccentric forces to enhance deceleration component intensity each phase



Overarching Theme

Absorb force — *and then* — re-apply it.

Programming Considerations: Weight Room

Bilateral vs. Unilateral	• Bilateral loading ⇒ easier and less intense • Unilateral loading ⇒ harder and more intense
Internal vs. External	• Internal resistance ⇒ bodyweight • External resistance ⇒ external loading
Stick vs. Rebound	• Stick ⇒ force absorption (“pumping the brakes”) • Rebound ⇒ post -braking propulsive force
Simple vs. Complex	• One Direction ⇒ sagittal or frontal plane of motion • Multi -Directional ⇒ combine planes of motion

Weight Room Decel Package (Lunge Series)

	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8
Intent	Master The Basics: Improve Deceleration (Absorb Force)					Level Up: Absorb Force & Re -Apply It		
Sagittal Plane	Drop Squat to Stick	Drop Reverse Lunge to Stick	DB Drop Forward Lunge w/ Catch	Band Resisted Drop Forward Lunge w/ Stick	MB Drop Skater Squat to Stick	WV Elevated Drop Forward Lunge w/ Rebound	Band Resisted Drop Forward Lunge w/ Rebound	Band Resisted Drop Forward Lunge w/ Rebound, Release, Squat Jump & Stick
Frontal Plane	Drop Lateral Squat to Stick	Drop Lateral Lunge to Stick	KB Hang Drop Lateral Lunge w/ Catch	Band Resisted Drop Lateral Lunge w/ Stick	MB Skater Hop w/ Chop & Stick	WV Elevated Drop Lateral Lunge w/ Rebound	Band Resisted Drop Lateral Lunge w/ Rebound	Band Resisted Drop Lateral Lunge w/ Rebound, Release, Broad Jump & Stick

Weight Room - Sagittal Plane: **Level 1**



[Drop Squat to Stick](#)

Weight Room - Sagittal Plane: **Level 2**



[Drop Reverse Lunge to Stick](#)

Weight Room - Sagittal Plane: **Level 3**



[DB Drop Forward Lunge w/ Catch](#)

Weight Room - Sagittal Plane: **Level 4**



[Band Resisted Drop Forward Lunge w/ Stick](#)

Weight Room - Sagittal Plane: **Level 5**



[MB Drop Skater Squat to Stick](#)

Weight Room - Sagittal Plane: **Level 6**



[WV Elevated Drop Forward Lunge w/ Rebound](#)

Inspiration for *Rebound* - Alex Natera

Weight Room - Sagittal Plane: **Level 7**



[Band Resisted Drop Forward Lunge w/ Rebound](#)

Weight Room - Sagittal Plane: **Level 8**



[Band Resisted Drop Forward Lunge w/
Rebound, Release, Squat Jump & Stick](#)

Weight Room - Frontal Plane: **Level 1**



[Drop Lateral Squat to Stick](#)

Weight Room - Frontal Plane: **Level 2**



[Drop Lateral Lunge to Stick](#)

Weight Room - Frontal Plane: **Level 3**



[KB Hang Drop Lateral Lunge w/ Catch](#)

Weight Room - Frontal Plane: **Level 4**



[Band Resisted Drop Lateral Lunge w/ Stick](#)

Weight Room - Frontal Plane: **Level 5**



[MB Skater Hop w/ Chop & Stick](#)

Weight Room - Frontal Plane: **Level 6**



[WV Elevated Drop Lateral Lunge w/ Rebound](#)

Weight Room - Frontal Plane: **Level 7**



[Band Resisted Drop Lateral Lunge w/ Rebound](#)

Weight Room - Frontal Plane: **Level 8**



Band Resisted Drop Lateral Lunge w/
Rebound, Release, Broad Jump & Stick

Weight Room - Multi-Directional: Bonus



[Drop Lunge 8 -Point Wheel Drill \(Clockwise\)](#)



[Drop Lunge 8 -Point Wheel Drill \(Counter -Clockwise\)](#)

Inspiration for *Wheel Drill* - Mitch Greaves

Section 5: Deceleration Training

Weight Room Decel Package (Close-Out Series)

	Level 1	Level 2	Level 3	Level 4
Intent	Master The Basics: Improve Deceleration (Absorb Force)		Level Up: Absorb Force & Re -Apply It	
Forward Direction	Forward Close -Out w/ Stick	Forward Close -Out w/ 1 -Leg Stick	Forward Close -Out to Skater Hop w/ Stick	Band Forward Close -Out w/ Release to Skater Hop & Stick
Reverse Direction	Reverse Close -Out w/ Stick	Reverse Close -Out w/ 1 -Leg Stick	Reverse Close -Out to Skater Hop w/ Stick	Band Reverse Close -Out w/ Release to Skater Hop & Stick
Lateral Direction	Lateral Close -Out w/ Stick	Lateral Close -Out w/ 1 -Leg Stick	Lateral Close -Out to Skater Hop w/ Stick	Band Lateral Close -Out w/ Release to Skater Hop & Stick

Weight Room - Forward Direction: **Level 1**



Forward Close -Out w/ Stick

Weight Room - Forward Direction: **Level 2**



[Forward Close -Out w/ 1 -Leg Stick](#)

Weight Room - Forward Direction: **Level 3**



Forward Close -Out to Skater Hop w/ Stick

Weight Room - Forward Direction: **Level 4**



[Band Forward Close -Out w/ Release to Skater Hop & Stick](#)

Weight Room - Reverse Direction: **Level 1**



[Reverse Close -Out w/ Stick](#)

Weight Room - Reverse Direction: **Level 2**



[Reverse Close -Out w/ 1 -Leg Stick](#)

Weight Room - Reverse Direction: **Level 3**



Reverse Close -Out to Skater Hop w/ Stick

Weight Room - Reverse Direction: **Level 4**



[Band Reverse Close -Out w/ Release to Skater Hop & Stick](#)

Weight Room - Lateral Direction: **Level 1**



Lateral Close -Out w/ Stick

Weight Room - Lateral Direction: **Level 2**



[Lateral Close -Out w/ 1 -Leg Stick](#)

Weight Room - Lateral Direction: **Level 3**



Lateral Close -Out to Skater Hop w/ Stick

Weight Room - Lateral Direction: **Level 4**



[Band Lateral Close -Out w/ Release to Skater Hop & Stick](#)

Weight Room - Multi-Directional: Bonus



Close-Out 8-Point Wheel Drill (Clockwise)



Close-Out 8-Point Wheel Drill (Counter -Clockwise)

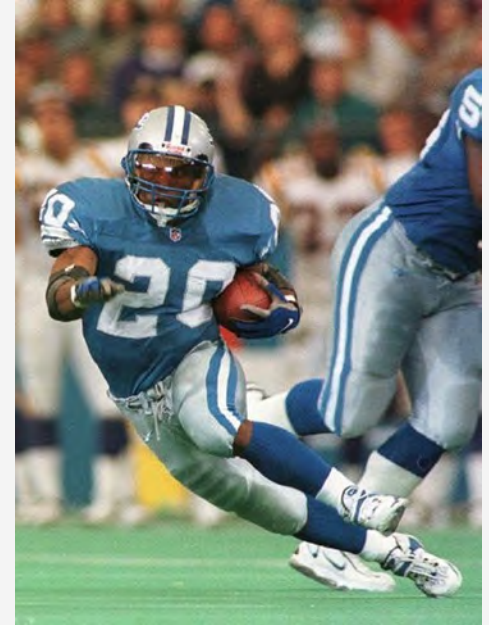
Primary Goals & Programming: Field/Court

Continuum:

Acceleration ⇒ Deceleration ⇒ Reacceleration

C.o.D. vs.
Agility

- Rehearsed, pre-planned and known stimulus
- Reactionary, decision-making and external stimulus



Field/Court Decel Package (Novice Series)

	Level 1	Level 2	Level 3	Level 4
C.o.D. (rehearsed)	5-Yard Sprint & Rehearsed Stop	5-Yard Sprint, Rehearsed Stop & Go	5-Yard Sprint & Rehearsed Y -Turn	5-Yard Sprint & Rehearsed T -Turn
Agility (reactionary)	Sprint & Reactionary Stop	Sprint & Reactionary Y-Turn	Sprint & Reactionary T-Turn	---

Field/Court - C.o.D.: **Level 1**



[5-Yard Sprint & Rehearsed Stop](#)

Field/Court - C.o.D.: **Level 2**



[5-Yard Sprint, Rehearsed Stop & Go](#)

Field/Court - C.o.D.: **Level 3**



[5-Yard Sprint & Rehearsed Y -Turn](#)

Field/Court - C.o.D.: **Level 4**



[5-Yard Sprint & Rehearsed T -Turn](#)

Field/Court - Agility: **Level 1**



[Sprint & Reactionary Stop](#)

Field/Court - Agility: **Level 2**



[Sprint & Reactionary Y -Turn](#)

Field/Court - Agility: **Level 3**



[Sprint & Reactionary T -Turn](#)

Field/Court Decel Package (Advanced Series)

	Level 1	Level 2	Level 3	Level 4
C.o.D. (rehearsed)	5-Yard Sprint to Rehearsed Curved Run	5-Yard Backpedal to Rehearsed Turn & Sprint	5-Yard Lateral Shuffle to Rehearsed Turn & Sprint	---
Agility (reactionary)	5-Yard Partner Chase & Hip Tap Reactionary T -Turn (Sprinter Reacts to Chaser)	5-Yard Partner Chase & Verbal Reactionary T-Turn (Sprinter Reacts to Chaser)	5-Yard Partner Chase & Non-Verbal Reactionary T -Turn (Chaser Reacts to Sprinter)	5-Yard Partner Chase & Verbal Reactionary T-Turn (Chaser Reacts to Sprinter)

Field/Court - C.o.D.: **Level 1**



5-Yard Sprint to Rehearsed Curved Run

Field/Court - C.o.D.: **Level 2**



5-Yard Backpedal to Rehearsed Turn & Sprint

Field/Court - C.o.D.: **Level 3**



5-Yard Lateral Shuffle to Rehearsed
Turn & Sprint

Field/Court - Agility: **Level 1**



5-Yard Partner Chase & Hip Tap
Reactionary T -Turn (Sprinter Reacts to
Chaser)

Non-Verbal = Chaser taps right or left hip
of Sprinter and Sprinter reacts

Field/Court - Agility: **Level 2**



5-Yard Partner Chase & Verbal
Reactionary T -Turn (Sprinter Reacts to
Chaser)

Verbal = Chaser says "Right" or "Left"
and Sprinter reacts

Field/Court - Agility: **Level 3**



5-Yard Partner Chase & Non -Verbal
Reactionary T -Turn (Chaser Reacts to
Sprinter)

Non-Verbal = Sprinter makes decision
(right or left) and Chaser reacts

Field/Court - Agility: **Level 4**



5-Yard Partner Chase & Verbal
Reactionary T -Turn (Chaser Reacts to
Sprinter)

Verbal = Sprinter says "Right" or "Left"
and Chaser reacts

Field/Court - Multi-Directional Agility: Bonus



Face-Off Drill: Sprint Toward Opponent &
Non-Verbal Reactionary Sidestep to
Sprint

Non-Verbal = Decision -maker sidesteps
(right or left) and Reactor reacts

Closing Remarks

Key Takeaways

- Understand the difference of force application between **force absorption and force production**
- Add **direct loading and eccentric strengthening** into your training programs to reduce risk of lower body injuries
- Incorporate **deceleration training** exercises that focus on **absorbing force, accepting load, and landing technique**

References

1. Aerts I, Cumps E, Verhagen E, Mathieu N, Van Schuerbeeck S, Meeusen R. A 3-month jump-landing training program: A feasibility study using the RE-ALM framework. *J Athl Train*. 2013; 48(3):296305.
2. Alonso-Fernandez D, Fernandez-Rodriguez R, Abalo-Núñez R. Changes in rectus femoris architecture induced by the reverse nordic hamstring exercises. *J Sports Med Phys Fitness*. 2019; 59(4):640647.
3. Askling C, Tengvar M, Thorstensson A. Acute hamstring injuries in Swedish elite football: A prospective randomised controlled clinical trial comparing two rehabilitation protocols. *Br J Sports Med*. 2014; 47:95959.
4. Christopher Z, Hassebrock J, Anastasi M, Economopoulos K. Hip flexor injuries in the athlete. *Clin Sports Med*. 2021; 40(5).
5. DiStefano L, Marshall S, Padua D, Peck K, Beutler A, de la Motte S, Frank B, Martinez J, Cameron K. The effects of an injury prevention program on landing biomechanics over time. *Am J Sports Med*. 2016; 44(3):76776.
6. Eckard T, Padua D, Dompier T, Dalton S, Thorborg K, Kerr Z. Epidemiology of hip flexor and hip adductor strains in national collegiate athletic association athletes, 2009/2010 -2014/2015. *Am J Sports Med*. 2017; 45(12):2713722.
7. Esteve E, Rathleff M, Bagur-Calafat C, Urrútia G, Thorborg K. Prevention of groin injuries in sports: A systematic review with meta-analysis of randomised controlled trials. *Br J Sports Med*. 2015; 49:785791.
8. Green B, Pizzari T. Calf muscle strain injuries in sport: A systematic review of risk factors for injury. *Br J Sports Med*. 2017; 51:1189194.
9. Gretchen O, Christopher D. The razor curl: A functional approach to hamstring training. *Strength Cond J*. 2009; 23(2):401405.
10. Hewitt J, Cronin J, Button C, Hume P. Understanding deceleration in sport. *Strength Cond J*. 2011; 33(1):432.
11. Holmich P, Thorborg K, Dehlendorf K, Krosgaard K, Gluud C. Incidence and clinical presentation of groin injuries in sub-elite male soccer. *Br J Sports Med*. 2013.
12. Jeronimo L, Pelot T. Rate of force acceptance as an injury prevention strategy in athletic populations. *USOC: Olympic Coach Sport Performance Division*. 2016; 27(1):342.
13. Kary J. Diagnosis and management of quadriceps strains and contusions. *Curr Rev Musculoskelet Med*. 2010; 3(14):26-31.
14. Majewski M, Habelt S, Steinbrück K. Epidemiology of athletic knee injuries: A 10-year study. *The Knee*. 2006; 13(3):184188.
15. Polglass G, Burrows A, Willett M. Impact of a modified progressive Copenhagen adduction exercise programme on hip adduction strength and postexercise muscle soreness in professional footballers. *BMJ Open Sport Exerc Med*. 2019; 5(1).
16. Root H, Trojjan T, Martinez J, Kraemer W, DiStefano L. Landing technique and performance in youth athletes after a single injury-prevention program session. *J Athl Train*. 2015; 50(11):1149157.
17. Schoenfeld B, Vigotsky A, Grigic J, Haun C, Contreras B, Delcastillo K, Francis A, Cote G, Alto A. Do the anatomical and physiological properties of a muscle determine its adaptive response to different loading protocols? *Physiol Rep*. 2020; 8(9).
18. Serner A, Weir A, Tol J, Thorborg K, Roemer F, Guermazi A, Yamashiro E, Hölmich E. Characteristics of acute groin injuries in the hip flexor muscles - a detailed MRI study in athletes. *Scand J Med Sci Sports*. 2018; 28(2):677685.
19. Silbernagel K, Crossley K. A proposed return-to-sport program for patients with midportion Achilles tendinopathy: Rationale and implementation. *J Orthop Sports Phys Ther*. 2015; 45(11):8766.
20. Tyler T, Silvers H, Gerhardt M, Nicholas S. Groin injuries in sports medicine. *Sports Health*. 2010; 2(3):23236.
21. van Dyk N, Behan F, Whiteley R. Including the Nordic hamstring exercise in injury prevention programmes halves the rate of hamstring injuries: a systematic review and meta-analysis of 8459 athletes. *Br J Sports Med*. 2019; 53(21):13621370.
22. Vogt M, Hoppeler H. Eccentric exercise: Mechanisms and effects when used as training regime or training adjunct. *J Appl Physiol*. 2014; 116(11):144854.
23. Wing C, Bishop C. Hamstring strain injuries: Incidence, mechanisms, risk factors, and training recommendations. *Strength Cond J*. 2020; 42(3):40-57.
24. Winters M. The diagnosis and management of medial tibial stress syndrome: An evidence update. *Unfallchirurg*. 2020; 123(Suppl 1):119.
25. Yang X, Meng H, Quan Q, Peng J, Lu S, Wang A. Management of acute Achilles tendon ruptures: A review. *Bone Joint Res*. 2018; 7(10):56569.

Closing Remarks

Apply These Skills: 6-Week Training Program



4 Workouts/Week

| 40+ Exercise Videos

| Coaching Notes

| No Equipment

Closing Remarks

Stay Connected

- **Instagram:** @matthewibrahim_
- **Email:** matthew.ibrahim001@gmail.com

