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Sport Injury Prevention Research Centre

SHRED injuries

Neuromuscular Training Programs

Supporting Injury Prevention in High School Sport

CIAAA 2021

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Introduction: Presenters

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Sport Injury Prevention Research Centre

University of Calgary

cvanden@ucalgary.ca

Agenda

Background

Exercise demonstration & participation

Discussion: Implementation

Final Q&A

Introduction: Sport Injury Prevention Research Centre

Research lab

Team of faculty, students & staff

Knowledge translation

Community partnerships

Alberta Ballet School

Alberta Basketball
Alberta Children's Hospital Research Institute
Alberta Health Services Bone & Joint Strategic Clinical Network
Alberta Innovates
Alberta Schools' Athletic Association
BC Injury Research and Prevention Unit
Calgary Board of Education
Calgary Catholic School District
Calgary Minor Soccer Association
Canadian Traumatic Brain Injury Research Consortium
Canada Research Chairs Program
Canada Foundation for Innovation
Canadian Institute of Health Research
CIHR Team in Child & Youth Injury Prevention
Ever Active Schools
Football Canada
GE Healthcare | NBA
Harvest Half Marathon
Hockey Calgary
Hockey Canada
Hotchkiss Brain Institute
Injury Prevention Centre
Integrated Concussion Research Program University of Calgary
McCaig Institute for Bone and Joint Health
Momentum Health
National Football League Scientific Advisory Board
O'Brien Institute for Public Health
Parachute
PolicyWise for Children & Families
Rugby Canada
Soccer Canada
USPORTS
Vi Riddell Pediatric Rehabilitation Research Program
Volleyball Canada
Winsport

Learning Objectives

Understand the importance of Neuromuscular Training (NMT)

Understand the basics of proper movement technique

Develop a plan to be able to implement NMT within your school setting

Why do we warm up?

When asked why we warm up, common answers include:

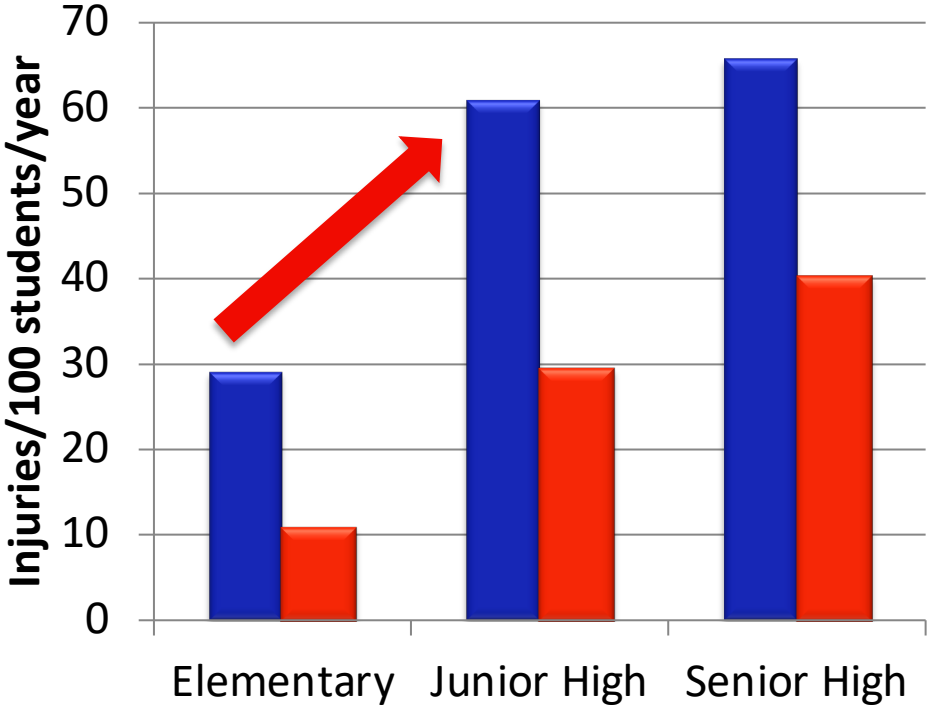
“To prepare for activity”

Physical

“To prevent injuries”

Mental

Sport and Recreational Injury



- Injuries over past year
- Injuries requiring medical attention

Emery et al., 2009

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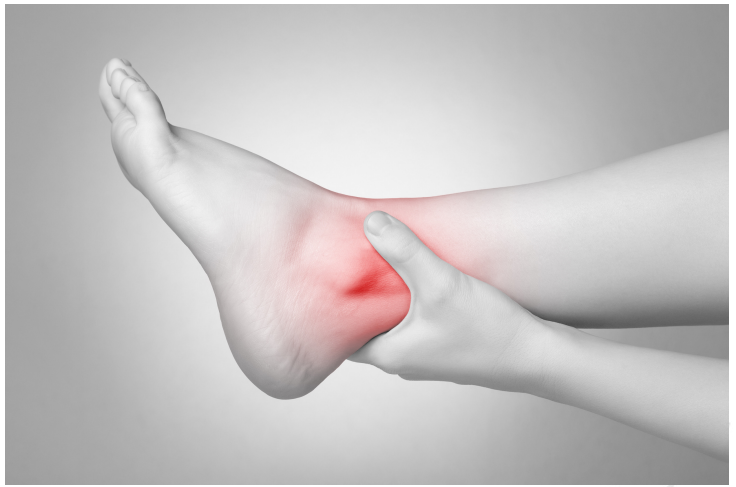
Injuries in youth sport & recreation



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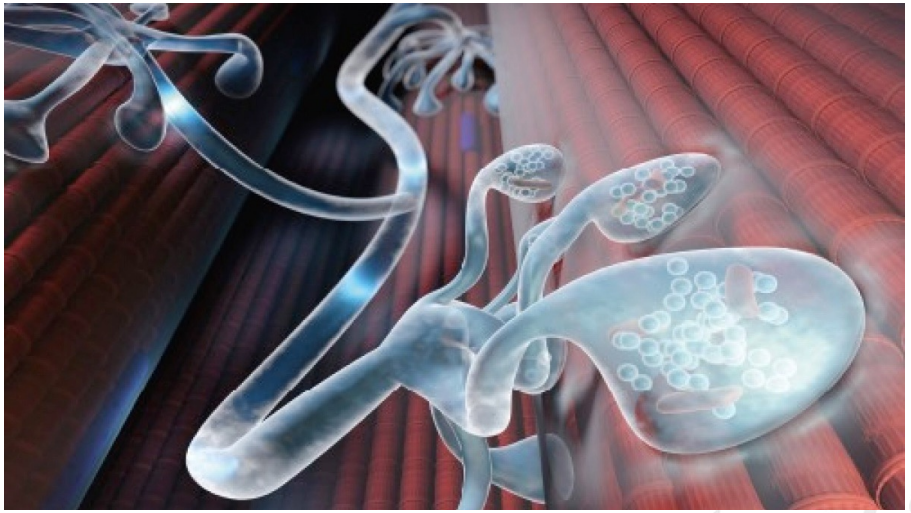
Enter: Neuromuscular Training



Exercises that train the **nervous** and **muscular** systems to work together to produce optimal muscle activation patterns.

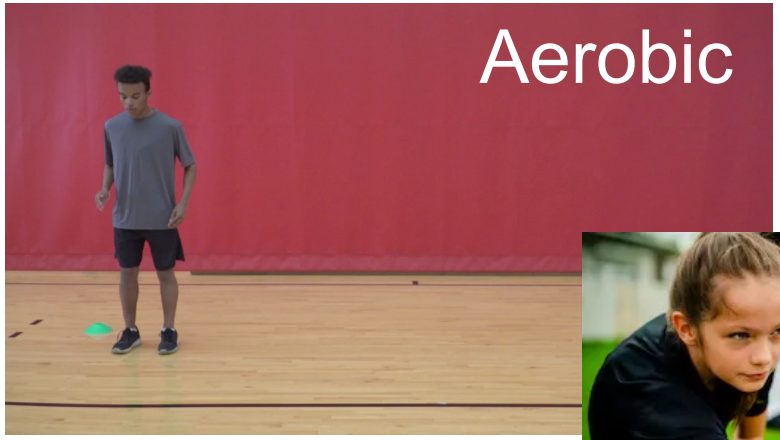
This is needed to:

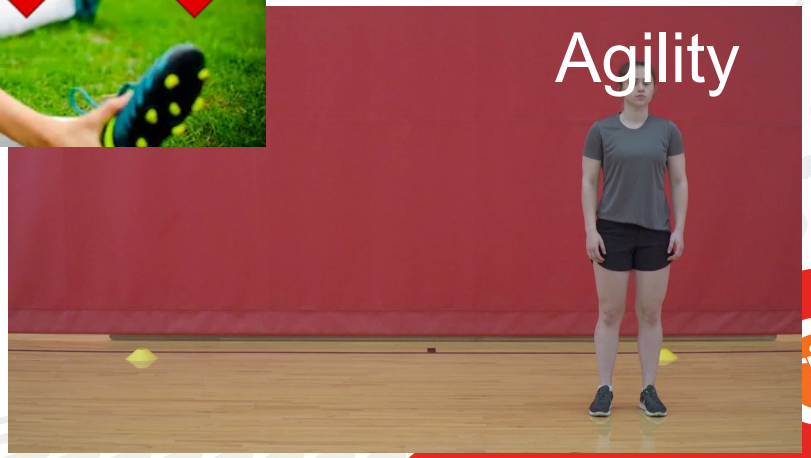
- ✓ support dynamic joint stability (joint control)
- ✓ decrease joint forces (e.g. heavy landing creating poor force absorption)
- ✓ improve movement patterns (proper landing and cutting techniques)
- ✓ improve motor programming (think ‘muscle memory’)

NMT exercises

- Bodyweight
- Partner-resistance
- Little or no equipment
  - Resistance bands
  - Sport-specific equipment (balls, sticks, racquets)
- COVID-friendly ☺
- Controlled
- Movement quality > Quantity
- Long-term outcome: Building joint resiliency over time
  - *Consistency

Neuromuscular Training





Let’s talk about static stretching

- No evidence demonstrating protective effects against injuries when used as a warm-up
- May decrease power (Think: “Explosiveness”)
  - Jump height
  - Acceleration

*Static stretching is not BAD… but consider alternative exercises when warming up

The Evolution of Neuromuscular Training

Clinical Rehabilitation → Sport performance → Warm-up programs → Warm-up programs

Community | Professional sport | Community

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IOC Consensus on Youth Athlete Development

Consensus statement

International Olympic Committee consensus statement on youth athletic development

Michael F Bergeron,[1,2] Margo Mountjoy,[3,4] Neil Armstrong,[5] Michael Chia,[6] Jean Côté,[7] Carolyn A Emery,[8] Avery Faigenbaum,[9] Gary Hall Jr,[10] Susi Kriemler,[11] Michel Léglise,[12] Robert M Malina,[13,14] Anne Marte Pensgaard,[15] Alex Sanchez,[16] Torbjørn Soligard,[17] Jorunn Sundgot-Borgen,[18] Willem van Mechelen,[19,20,21] Juanita R Weissensteiner,[22] Lars Engebretsen[17,23]

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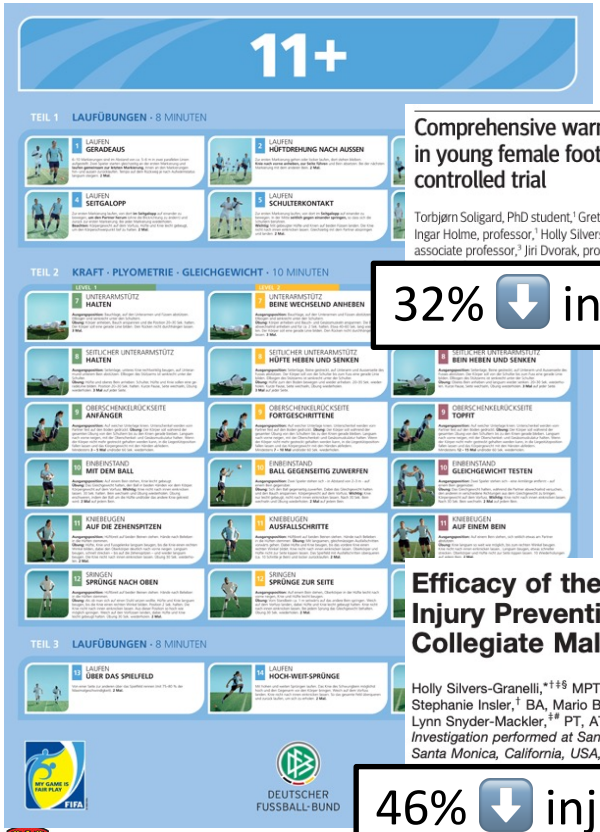
NMT for Youth Athlete



Comprehensive warm-up programme to prevent injuries in young female footballers: cluster randomised controlled trial

Torbjørn Soligard, PhD student,[1] Grethe Myklebust, associate professor,[1] Kathrin Steffen, research fellow,[1] Ingar Holme, professor,[1] Holly Silvers, physical therapist,[2] Mario Bizzini, physical therapist,[3] Astrid Junge, associate professor,[3] Jiri Dvorak, professor,[3] Roald Bahr, professor,[1] Thor Einar Andersen, associate

32% ⬇ injuries (females)

72% ⬇ injuries (3x per week)

Efficacy of the FIFA 11+ Injury Prevention Program in the Collegiate Male Soccer Player

Holly Silvers-Granelli,*†‡§ MPT, Bert Mandelbaum,†§ MD, Ola Adeniji,† MS, Stephanie Insler,† BA, Mario Bizzini,‖ PT, PhD, Ryan Pohlig,¶ PhD, Astrid Junge,‖ PhD, Lynn Snyder-Mackler,‡# PT, ATC, ScD, and Jiri Dvorak,‖ MD
Investigation performed at Santa Monica Sports Medicine Foundation, Santa Monica, California, USA, and the University of Delaware, Newark, Delaware, USA

46% ⬇ injuries (males)

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NMT in Calgary Jr High Schools

Original article

Implementing a junior high school-based programme to reduce sports injuries through neuromuscular training (iSPRINT): a cluster randomised controlled trial (RCT)

Carolyn A Emery ,[1,2] Carla van den Berg,[1] Sarah Ann Richmond,[3,4] Luz Palacios-Derflingher,[1,5] Carly D McKay,[6] Patricia K Doyle-Baker,[7] Megan McKinlay,[8] Clodagh M Toomey ,[1] Alberto Nettel-Aguirre,[2] Evert Verhagen,[9] Kathy Belton,[10] Alison Macpherson,[11] Brent E Hagel [2]

How can I implement NMT in my school?

PE

- **Warm-up before every class**
- Workout (e.g. “Fitness Fridays”)
- Zoom activity

CLASSROOM

- Movement break
- Sport med curriculum
- Sport performance curriculum

SPORTS TEAM

- **Warm-up before every practice & game**
- “Strength & Conditioning” session
- Pre-season training

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Key Cues

Head neutral

Pinch shoulders

Shoulders level with hips

Brace through trunk

Chest up (“Proud chest”)

Hip, knee, and ankle in line;
Soft knee bend

Knees over toes;
Avoid knees caving inward

- The following slides list exercises that can be included in the Aerobic, Balance, Strength, and Agility categories. This is by no means an exhaustive list of neuromuscular training exercises, but are the ones that we focused on during this presentation.
- For detailed points on cues & what to look for when students perform exercises, visit our website: https://ucalgary.ca/sport-injury-prevention-research-centre/resources/neuromuscular-training-resources

Aerobic exercises

Jogging

- Forward
- Backward
- S-shape (Curvelinear)

Running mechanics

- A marches
- A skips
- B skips
- High knees

Heel kicks

Side shuffles

Karaoke/Grapevine

Skipping

- Forward backward
- Lateral

Balance exercises

Individual
Single-leg
Single-leg with activity
Airplane balance
Partner
Taps
Jousting
Passing
Pass with jump catch
Hip hinge ball roll

Balance: Individual variations

- Single leg balance standing on the floor
- Eyes open/eyes closed
- Single leg balance standing on unstable surface (e.g. mat, sand, pillow)
- Single leg balance while bouncing a ball

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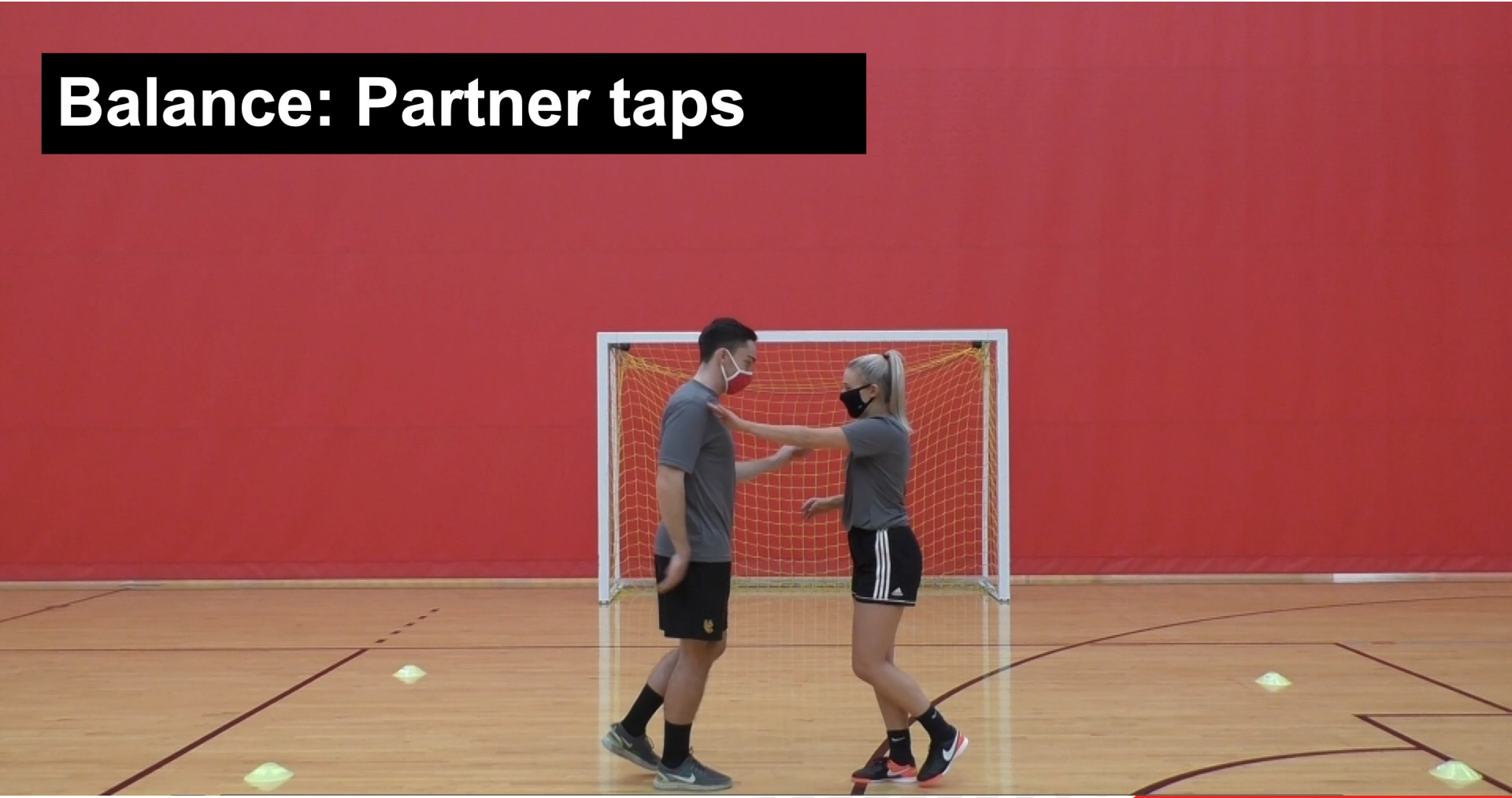
Airplane balance

Balance: Partner taps




Balance: Partner passing variations


Balance: Partner passing variations


Balance: Partner passing variations


Balance: Partner passing variations

Strength-based exercises

Trunk (& Shoulders)

- Front plank
- Side plank
- Bear crawl

Hamstring/Glutes

- Nordic hamstring curl
- Glute bridge
- Hinging

Adductors (Groin)

- Copenhagen adductor

Quads/Glutes

- Squats
- Split squats
- Walking lunges: forward & backward
- Walking lunges with torso rotation
- Walking lunges with leg lift
- 4D lunges
- Lateral lunges with arm swings

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Nordic hamstring

Lunges


Lunges


Lunges


Lunges


Lunges


Lunge GAMES


Plank variations


Plank variations


Plank variations


Plank variations


Bear crawl GAMES – Partner mirroring


Bear crawl GAMES – Cone tag


Plank GAMES – Cone/Ball pass


Plank GAMES – Conveyer belt

Agility exercises

Running-based (Decelerations)
Zig-zag running
Partner direction change
Quick start & stops
Shuttle runs
Jumping
Weight transfer (Skate jumps)
Controlled landings (Knee focus)
Continuous (Ankle focus)
Hopping
Controlled landing (Knee focus)
Continuous (Ankle focus)

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Jump/Hop variations:

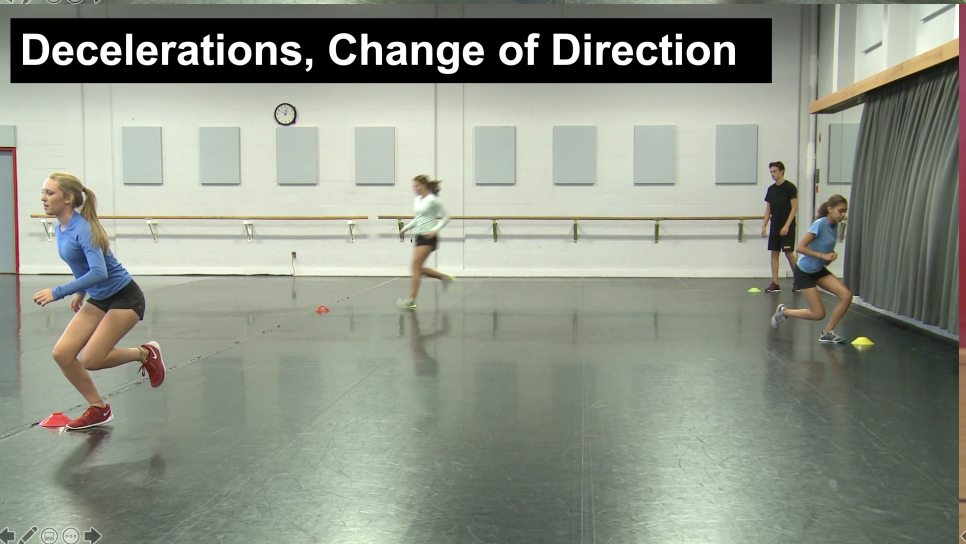
- On the spot
- Fwd/Back, Side-to-side
- 2-leg takeoff→1 leg landing
- Skate jumps

Jump with partner contact


Jumping GAMES


Decelerations, Change of Direction


Decelerations, Change of Direction


Decelerations, Change of Direction

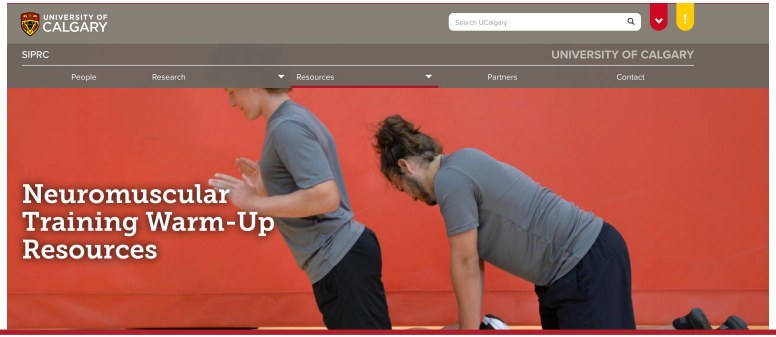

Decelerations, Change of Direction


Deceleration GAMES

Take-home Messages

- Consistency
  - Make it a habit! →Makes your life easier as well
  - Minimum 2-3x per week optimal
- Quality over quantity
  - Supervision & feedback
  - Be mindful of games
- 4 main components:
  - Aerobic
  - Balance
  - Strength
  - Agility

Neuromuscular Training Resources



www.ucalgary.ca/siprc/resources

www.everactive.org/product/lets-warm-up-poster/

www.fittoplay.org

Discussion Questions

- How can you see Neuromuscular Training **integrated** within your school's athletics program?

- What are some **barriers** you foresee that might make this integration challenging?

- What can help you **facilitate** the integration of Neuromuscular Training?

Neuromuscular Training Resources

There are a many different neuromuscular training programs that have been developed to help prevent injuries in sport and improve movement skills. Each program is slightly different as it has been developed for a specific sport/activity, but all are similar in that they include Aerobic, Balance, Strength, and Agility exercises and are evidence-informed.

These programs are most effective when implemented consistently and with an emphasis on correct movement technique.

We have included a list of programs on the following slides.

We recommend you take the time to look through the different programs – even if you are not coaching/teaching the specific sport, you may find exercises that you can use in your own programming!

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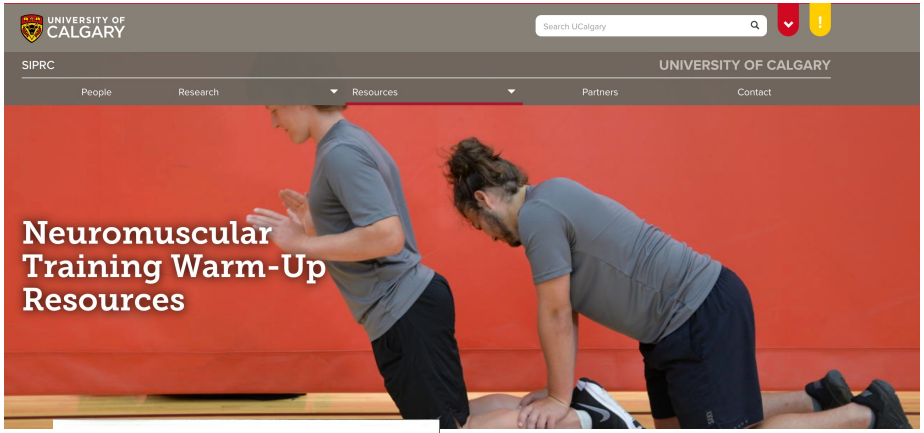
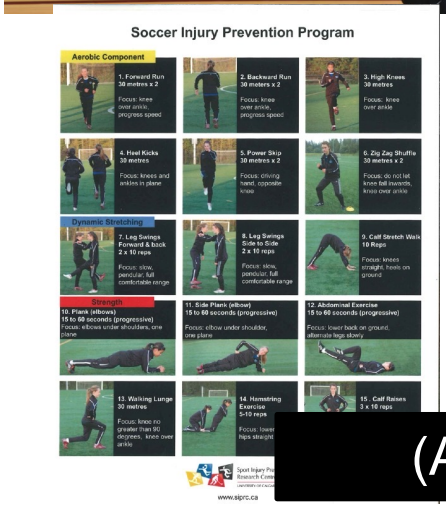
Neuromuscular Training Resources

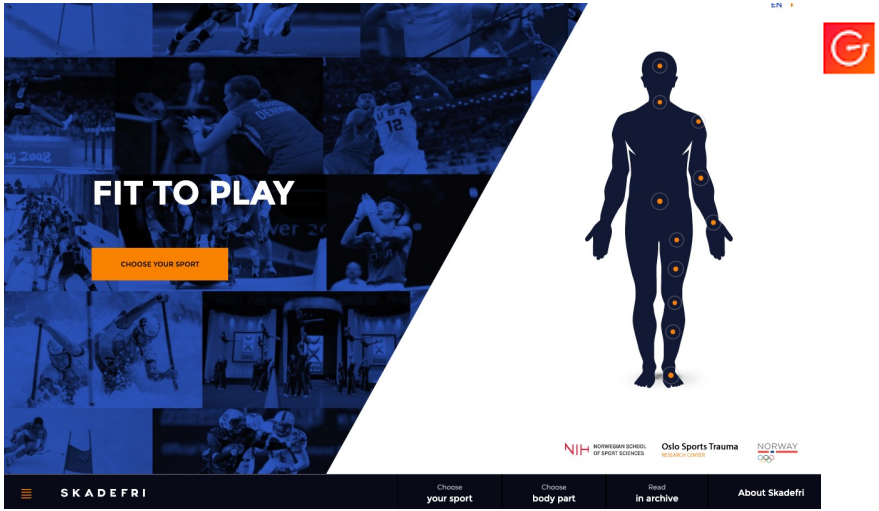


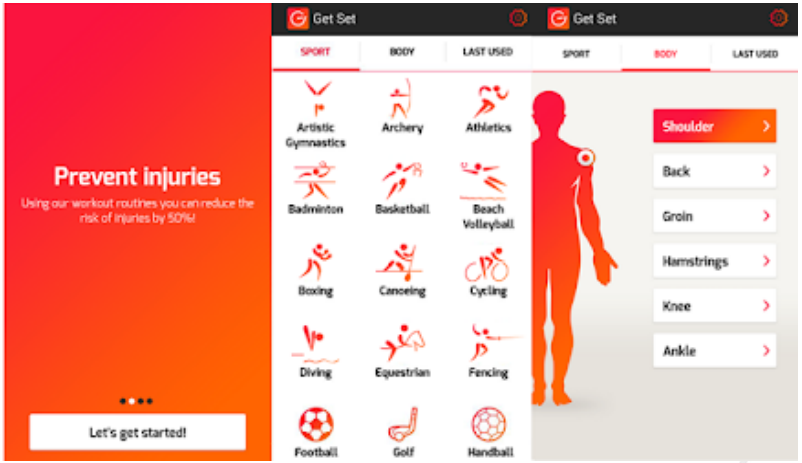
https://ucalgary.ca/sport-injury-prevention-research-centre/resources/neuromuscular-training-resources



(And coming soon: ucalgary.ca/shred-injuries)

Neuromuscular Training Resources





www.fittoplay.org

"Get Set – Train Smarter" app

Same thing! Website vs App version

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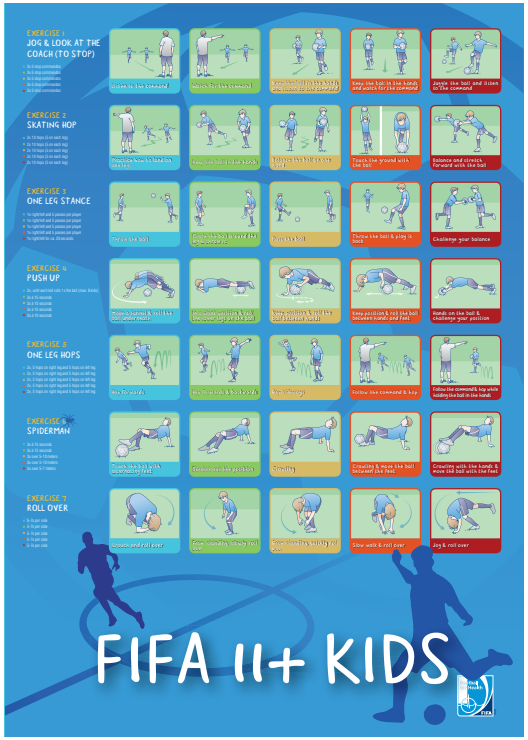
Neuromuscular Training Resources



https://www.fifamedicalnetwork.com/wp-content/uploads/2016/11/11_kids_poster.pdf

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Neuromuscular Training Resources

https://www.fifamedicalnetwork.com/lessons/prevention-fifa-11/

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Neuromuscular Training Resources

https://www.englandrugby.com/participation/coaching/activate

Professional Development Workshops for Teachers and Coaches

Alberta Health Services
Bone & Joint Health Strategic Clinical Network™

Thanks to support from the Bone & Joint Health Strategic Clinical Network, the Sport Injury Prevention Research Centre offers free 2-hour workshops on neuromuscular training programs for injury prevention.

We are currently offering these sessions virtually, at no cost.

If you enjoyed today's presentation and would like to schedule a full workshop with coaches within your organization or with teachers in your school/district, please contact Carla Vandenberg at cvanden@ucalgary.ca.

Participants who attend are eligible to receive 2 NCCP credits. Please note we request a minimum of 10 participants for the session to run.

Alternatively, you can attend one of the general online workshops that we offer each month. Register via our Events page: https://events.ucalgary.ca/sport-injury-prevention-research-centre/

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THANK YOU!

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Instagram: **@siprc**

Website: **ucalgary.ca/siprc**

Alberta Health Services
Bone & Joint Health Strategic Clinical Network™

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