LOWER-BODY DECELERATION PROGRAMMING

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THANK YOU

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DECELERATION
DECELERATION

- The act of rapidly slowing the body or body part as part of a movement or as the cessation of a movement

- Locomotive Sprinting: COD, Stopping
- Landing Plyometrics, WL Catch
- Follow Through Throw, Kick
Figure 1. Deterministic model of deceleration.

DECELERATION

- Force

Eccentric

- Velocity

Concentric

High Vel.

Low Vel.
DECELERATION – MUSCULAR ACTION (ECCENTRIC)

Low Force – Low Velocity
- Body-weight Squats
- Rear Leg Elevated Split Squat
- SL ECC Box Squat

High Force – Low Velocity

High Force – High Velocity

Low Impact Force – High Velocity

High Impact Force – High Velocity
DECELERATION – COACHING VISUAL ANALYSIS
DECELERATION - VISUAL ANALYSIS

Kinematics for Sprint Deceleration Phase < 5m

- COM is posterior to foot contact
- Short step length
- Wide step width (> hip width)
- Higher step frequency
- Landing distance increased
- Braking/eccentric increased
- Larger joint angle displacement
- Posterior trunk lean
- Velocity will decrease to ZERO (may only last ms)

DECELERATION

SPECIFIC ATHLETIC POPULATIONS
- 1st and 2nd year
- Transfers
- Post-physical therapy

TESTING CATEGORIES
- Locomotive (e.g. Agility)
- Unilateral & bilateral plyometrics
- Unilateral & bilateral strength
- Bilateral strength-speed
DECELERATION: TESTS

• 5-0-5
• Pro-agility (5-10-5)
• T-drill test
• L & pattern sprints
• Sprint ($v_{max}$) & stopping distance

FOCUS IS ON TECHNIQUE TO STOP AND COD
DECELERATION: TESTS

• 360° hop (Moody, S, 2015)
• Box drop landing*
• Vertical countermovement jump (*landing)
• 1-step approach* CMJ_{vert}
• Depth jump_{vert}
• Bounds (contacts measure distance)
  • All jumps/hops can also be performed horizontal
• FOCUS IS ON LANDING/IMPACT TECHNIQUE

By definition: Hops are leaving the ground from one foot and landing on the same foot.
DECELERATION: TESTS

STRENGTH

• Back, front squats
• Single leg box squats
• Step-ups
  • Athlete’s ability during the eccentric phase

STRENGTH-SPEED

• Cleans (≤ 90° knee joint angle)
• Loaded CMJ_{vert} (≈10% BWT)
• Loaded CMJ_{horz} (≈10% BWT)
  • Athlete’s ability to absorb bar load or landing
# PURPOSE OF DECELERATION - LOCOMOTIVE

<table>
<thead>
<tr>
<th>Stopping</th>
<th>Change of Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gradual</td>
<td>Reverse Directions</td>
</tr>
<tr>
<td>Rapid</td>
<td>Large angle COD</td>
</tr>
<tr>
<td></td>
<td>Moderate angle COD</td>
</tr>
<tr>
<td></td>
<td>Small angle COD</td>
</tr>
</tbody>
</table>

- **Gradual Stopping**
  - Change of Direction:
    - Reverse Directions: Angle > 120°
    - Large angle COD: Angle 119-91°
    - Moderate angle COD
    - Small angle COD: Angle < 90°

- **Rapid Stopping**
DECELERATION – LINEAR GRADUAL

10m
DECELERATION – LINEAR RAPID

3 m
DECELERATION – CHANGE OF DIRECTION

• The > COD angle = > eccentric loading
• Consider the influence on DOMS
• Progression:
  • Small COD angle → Large COD Angle
    • Consider initial acceleration distance
    • Second acceleration distance
DECELERATION – REVERSE DIRECTION

• Determine the deceleration:
• Load & accelerate or Spin & stop
• Perform absent of sport skill 1st
• Initial acceleration distance
• Change on a mark or opponent
DECELERATION: PROGRAMMING

**Sets:** 2 or 3 may increase to 5 or 6

**Reps:** 2 initially then add as technique improves to 4 to 6

**Intensity:** 40% - 80% 1-RM (near maximal loads acceptable with efficient technique)

**Goal:** Landing in deep triple flexion
STRENGTH AND CONDITIONING

EXERCISES FOR DECELERATION
STRENGTH AND CONDITIONING

EXERCISES FOR DECELERATION

- Develop ability to decelerate external load bilaterally
- Requires proper landing mechanics
STRENGTH AND CONDITIONING EXERCISES FOR DECELERATION

- Volleyball
- Basketball
- Softball + Baseball
- Split Jerk
- American Football (WR, DB)
- Football (aka. soccer)
STRENGTH AND CONDITIONING EXERCISES FOR DECELERATION

- Box and obstacle jumps
- Applicable to sports with landings
- Adjust exercises to be performed with hops
STRENGTH AND CONDITIONING EXERCISES FOR DECELERATION

- Short ground contact time
- Hold landing
- Emphasize SSC
- Bilateral to unilateral (e.g. Hops)
STRENGTH AND CONDITIONING EXERCISES FOR DECELERATION

Posterior Chain Development

• Good mornings
• Stiffed-legged deadlifts (RDL)
• Glute-hamstring raises
• Reverse hyperextensions
• Loaded hip thrusts

➢ Strength
➢ Strength-endurance
➢ Progress to higher velocity execution
DECELERATION – PROGRAMMING

• Post- and off-season
• Start with small volume
• Incorporate in DWU
• Add during ECC block
• Provide 1 or 2 cues

• STR-SPD Deceleration focused exercises 15-50 reps / session
• Linear stop 5 (Sprint Vel_{pk})-20
• COD 10 (large \( \downarrow \)) -30 (small \( \downarrow \))
• RECOVERY! Minimize DOMS!
DECELERATION – PROGRAMMING

Repetitive Decelerations

Reactive strength

Short SSC & Long SSC

Stretch reflex

Develop a foundation of ECC strength


DECELERATION – PROGRAMMING

• Posterior-chain strength and power
• Hamstring muscle groups, gluteus maximus
• Lower-leg strength, ankle exercises
• Triple flexion at increasing velocities
• Strengthen the trunk musculature

DECELERATION - PROGRAMMING

**Basic Skill**
- Linear Long Stop Jumps hold Land
- Drop Landing Stop – COD
- Lateral Leap Hold
- Hops with Hold

**Intermediate Skill**
- Sprint 10-30 m Stop Jumps
- Depth Jumps 10-5-10; Shuttles
- Large Angle COD Repeat Hops

**Skill Mastery**
- Sprint +30 m Stop Repeat Jumps Depth Jumps w/sprint
- 10-5-10; Shuttles Small Angle COD Repeat Hops
# DECELERATION – PROGRAMMING

## Off-season Women’s Soccer Example

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hang MT Cleans</strong></td>
<td>Loaded CMJ&lt;sub&gt;vert&lt;/sub&gt;</td>
<td><strong>BWD MB Throw</strong></td>
<td><strong>Hang MT Cleans</strong></td>
</tr>
<tr>
<td>5x2 @ 85% 1RM</td>
<td>4x4 @ 10-30% BSQ 1RM</td>
<td>8x</td>
<td>5x3 @ 80% 1RM</td>
</tr>
<tr>
<td><strong>DB Split Jerk</strong></td>
<td>Lateral 6” Hurdle hops 3x6</td>
<td>Bounds</td>
<td>*DB Incline Bench Pr.</td>
</tr>
<tr>
<td>3x5RM</td>
<td>Multi 6” Hurdle hops 3x6</td>
<td>3x6</td>
<td>3x8-12RM</td>
</tr>
<tr>
<td><strong>Front Squat</strong></td>
<td>Multi-box Jumps 4x3</td>
<td>W-pattern agility 4x</td>
<td>*Inverted Row 3x12-15 Rep Max</td>
</tr>
<tr>
<td>4x6-8RM</td>
<td>Cycle Split Jumps 2x8</td>
<td>L-pattern agility 2xL + 2xR</td>
<td>Step-ups w/band ECC 4x6-8 ea. leg</td>
</tr>
<tr>
<td><strong>1-arm Row</strong></td>
<td>Lateral Leap and Hold 2x8</td>
<td>Angled sprint &lt;15m 2xL + 2xR</td>
<td>Loaded Hip Thrust 2x8-12 @ 50% BSQ1RM</td>
</tr>
<tr>
<td>3x8-12RM</td>
<td><strong>Ancillary (superset)</strong></td>
<td>Sprint 10m 5x</td>
<td><strong>Ancillary (superset)</strong></td>
</tr>
<tr>
<td><strong>SLDL (RDL)</strong></td>
<td>T-V-W 2x15</td>
<td>MB Tempo 2-3x30s-1min</td>
<td>T-V-W 2x15</td>
</tr>
<tr>
<td>2x8-12RM</td>
<td>1-leg heel raise 2x15</td>
<td><strong>MB Tempo</strong> 2-3x30s-1min</td>
<td>1-leg heel raise 2x15</td>
</tr>
<tr>
<td><strong>Trunk Circuit</strong></td>
<td>Rotational</td>
<td></td>
<td><strong>Trunk Circuit</strong></td>
</tr>
<tr>
<td><strong>Ancillary (superset)</strong></td>
<td></td>
<td></td>
<td>Static</td>
</tr>
</tbody>
</table>
DECELERATION – COACHING CUES

• “Get low”; “Lower your body”; “Drop your hips”
• “Plant outside foot”; “Load your leg(s)”; “Push knee(s) out”
• “Punch with your arms”; “Turn and reach”
• “Head and chest up”; “Focus on your direction”
• “Absorb with your leg (muscles)”; “Hips back”
THANK YOU FOR YOUR ATTENTION & TIME.

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