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- Email customerservice@PhysicalTherapy.com

PT Management of Soccer Injuries

Carol Mack, PT, DPT, SCS, CSCS, PN-1

1

Learning Outcomes

After this course, participants will be able to:

- Describe at least three biomechanics demands of soccer as applicable for rehabilitation.
- Identify at least three common injuries that can occur with the soccer athlete.
- Outline at least two soccer-specific return to play progressions and at least two functional tests to perform with injured athletes.

2

CONTINUED

Carol Mack

- Owner of CLE Sports PT & Performance
- DPT, Duquesne University, 2006
  - Four years varsity soccer
- Board Certified Specialist in Sports Physical Therapy
  - Specialties:
    - End-stage rehabilitation of soccer athletes
    - Female athletes
    - Runners.
- Certified Strength & Conditioning Specialist
- Precision Nutrition Level 1 Certified Coach.

3

CONTINUED

- Member, US Olympic Committee Volunteer Medical Staff.
- PT, Performance Coach, Beaumont School Athletics
- Distance Coach, Fleet Feet Sports Cleveland
- Former Chair, Female Athlete Special Interest Group (American Physical Therapy Association)
- Former chair, Cleveland Clinic's "Match Fit" soccer performance enhancement and injury risk reduction program

4

CONTINUED

SOCCER INJURIES

5

CONTINUED

Statistics

- Men's professional soccer: 8 per 1000 player hours
  - 2 injuries per player per season
- Youth- incidence increases with age
  - Women 15-19 yrs highest

(Ekstrand 2011
Rossler 2016
Giza 2005)

6

Statistics

- 60-87% injuries in lower extremity
  - Muscle strains 31-35%
    - Hamstring most common
    - Adductors
      - Often overuse injury
    - Quadriceps - kicking leg
    - Calf

(Ekstrand 2011
Waldén 2005
Giza 2005)

7

Statistics

- Ligament injury:
  - 18-19% of all injuries
- Ankle most common
  - 51% of all sprains
- Knee less, but more severe
  - Men: MCL
  - Women: ACL

(Ekstrand 2011
Waldén 2005
Giza 2005)

8

CONTINUED

Statistics

- ACL injury in women:
  - Professional soccer: .09 per 1000 hours
  - Amateur, collegiate: .1-.31
  - Adolescent: **1.0**

(Agel 2005
Arendt 1999
Giza 2005
Le Gall 2008)

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CONTINUED

Other Injuries

- Concussion
- Hip and groin injuries
  - .82 per 1000 hrs (Lundgardh, 2019 *Knee Surg Sports Traumatol Arthrosc*)
    - Primarily overuse - kicking, sprinting/running
  - Increased prevalence radiographic findings of cam and/or pincer deformities in elite soccer players (Gerhardt 2012)

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CONTINUED

SOCCER: TASK BREAKDOWN

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CONTINUED

Match Profile

- Sprint every 90 seconds
- Total sprint distance 1,025 +/- 150m
- **150-250** "brief intense actions" **per player** each **match**

12

Match Profile

- **111** "**on the ball activities**" per match
  - Performed in explosive manner
  - Near-maximal power production
- Average **726 cutting maneuvers** per match
  - Angles vary from 0-180^{o}
  - Most to 90^{o} or less *(Bloomfield, 2007)*

13

Level of Play

- **Lower** standards require **greater** taxing of physical capacity *(Bradley 2013)*
- Stronger opponents elicit less high intensity running and more time spent at lower speed
  - Versus teams of similar/lower ranking *(Hewitt 2014)*

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CONTINUED

Recovery in Soccer

- At least 72 hrs to achieve pre-match values
- Ekstrand- "underperforming" players at 2002 WC played mean of **12.5** matches 10 weeks prior
  - "Above expectation" performers: **9** matches prior
- Players in 2 matches/wk vs 1: 6.2x higher injuries (Dupont)

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CONTINUED

Recovery in Soccer

- Potential mechanisms of post-match fatigue (Nedelec, 2012)
  - Dehydration: minimal chance to rehydrate during match
  - Glycogen depletion: repeated sprints
  - Muscle damage: repetition in change of direction, acceleration, deceleration

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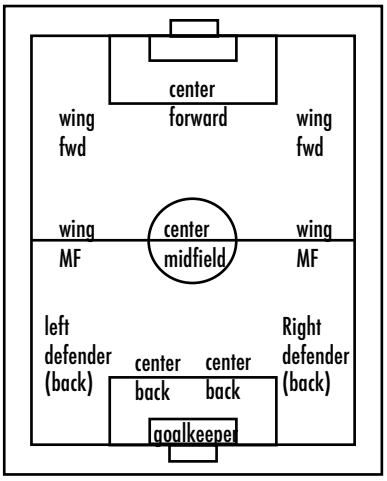
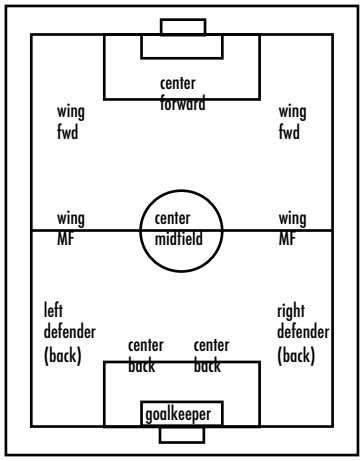
Soccer Positions



17

Task Breakdown: Position-Specific

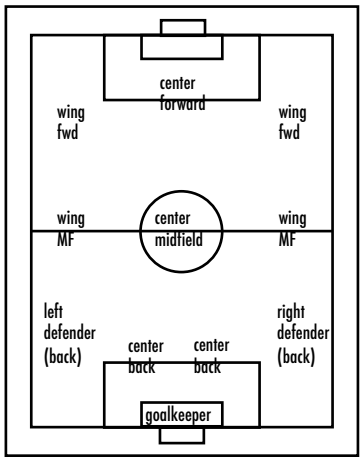
- Central midfield, fullback, forwards cover a greater distance in high-intensity running
  - Central defenders: less distance
- Wide midfielders: greater "very high-intensity running"



18

Task Breakdown: Position-Specific

- Wide midfield and central midfield: greater <u>total distance</u>
- Wide midfielders, forwards, fullbacks: greater <u>max running speed</u>



19

Task Breakdown: Position-Specific

- Emphasize the following types of fitness
  - Forwards and wing midfielders: anaerobic
  - Central midfield: aerobic
  - Goalkeepers: explosive strength

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Task Breakdown: Position-Specific

- Strength:
  - **No difference** between **field positions**
- **Goalkeepers:** greater hamstring, quadriceps concentric strength

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Task Breakdown: Goalkeeper

- Goal is 8' by 24'
- Goal area 18' x 18'
  - Quickest play occurs here
  - Game situations continually

Metz, McCracken, *NSCA Coach* 2015

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Task Breakdown: Goalkeeper

- Must be ready for
  - Shots
  - Breakaway
  - Corner kicks

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Task Breakdown: Goalkeeper

- Additional training
  - **Reaction training** essential
    - Example: listening to sound of “thud” on ball as it leaves attacker’s foot
  - Multidirectional speed and agility
  - Power

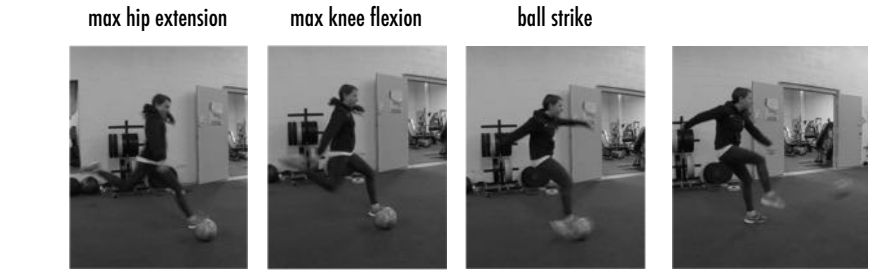
24

Biomechanics of Shooting

Published: *Journal of Orthopaedic & Sports Physical Therapy, 2007*, **Volume:** 37 **Issue:** 5 **Pages:** 260-268
doi:10.2519/jospt.2007.2255

25

Biomechanics of Shooting



Brophy, et al. **Published:** *Journal of Orthopaedic & Sports Physical Therapy, 2007*, **Volume:** 37 **Issue:** 5

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CONTINUED

INJURY SPECIFIC CONSIDERATIONS

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CONTINUED

ACL INJURY

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CONTINUED

Outcomes

- Younger athletes, males, more likely to return to play after ACL reconstruction (ACL-R)
- Return to soccer after ACL-R declines over time
  - 72% initially; 36% after 7 years
- ACL-R non-dominant limb places dominant limb at risk for future injury

Brophy 2012

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CONTINUED

Outcomes

- Case series (503 patients after ACL-R)
  - Competitive Australian FB, BB, netball, soccer
- Only 33% attempted competitive sport 12 months post-op
- 47% planned to return

(Ardern 2011)

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CONTINUED

Outcomes

- 1 in 4 young athletic patients who return to high-risk sports after ACL-R will sustain another injury
  - 30-40x greater risk of ACL injury vs uninjured

(Wiggins 2016)

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CONTINUED

Outcomes

- Increased odds ipsilateral graft failure:
  - Younger age, higher activity level
  - Allograft
- Increased odds contralateral ACL tear:
  - Younger age, higher activity

(Kaeding 2015)

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Outcomes

- 65% after ACLR returned to pre-injury sport within 2 yrs
  - 38% same level >2 years post ACLR
- Men 1.4x more likely to return to sport
- BPTB 1.2x

Ardern et al
Brophy et al
Cobbi and Francisco
Langford et al

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Outcomes

- Level 1: (Non-pro) pivoting athletes RTP 65%
  - 65% return within 2 yrs; 38% at same level >2 yrs
  - Pro soccer 71% 4 yrs post-op (Zaffagnini et al)

Table 5 Level of evidence of the conclusion (EBRO)

Level	Conclusion based on
1	A1 study or at least two independent studies of level A2
2	One study of level A2 or at least two independent studies of level B
3	One study of level B or C
4	Expert opinion

(Laboute et alVan Melick N, van Cingel REH, Brooijmans F, et al)

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CONTINUED

Time Based RTP

- "6 months"
- Re-injury/contralateral injury risk: highest 6-12 mo post-op
  - 15x more likely (Paterno, 2012)
- Nagelli and Hewett, 2016: RTP 2 years post-op
  - 6x more likely (Paterno, 2014)

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CONTINUED

Time based vs criteria based

- Decreased risk of re-injury:
  - Higher HS:Quad ratio (Kyritsis 2016)
    - Normal: 50-80% (Rosene 2001)
  - Higher limb symmetry
    - Involved: uninvolved quad strength (Grindem 2016)
    - Pivoting/contact/competitive athlete: 100%
    - Noncontact/rec sports: 90%

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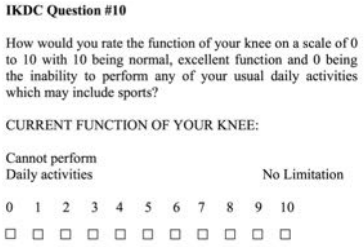
Criteria Based RTP

- Patient-reported measures:
  - IKDC 2000
    - MOON Guidelines: >/= 9
  - Global rating of perceived function
  - KOS
  - Lysholm



IKDC Question #10

How would you rate the function of your knee on a scale of 0 to 10 with 10 being normal, excellent function and 0 being the inability to perform any of your usual daily activities which may include sports?

CURRENT FUNCTION OF YOUR KNEE:

Cannot perform Daily activities — No Limitation

0 1 2 3 4 5 6 7 8 9 10

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Criteria Based RTP: Psychological Readiness

- ACL-RSI
  - Higher score = more positive psychological response
  - Suggested > 50 for return to practice (> 60 return to competition)
- Tampa Scale for Kinesiophobia (TSK)
  - Lower score = less fear of movement
  - Suggested < 17 for return to practice (<15 return to competition)

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Criteria Based RTP: Psychological Readiness

- Higher chance RTP:
  - High self-efficacy
  - High internal locus control
  - Low level fear

Wierike SC, van der Sluis A, van den Akker-Scheek I, et al. Psychosocial factors influencing the recovery of athletes with anterior cruciate ligament injury: a systematic review. Scand J Med Sci Sports 2012;23:527–40.

Everhart JS, Best TM, Flanigan DC. Psychological predictors of anterior cruciate ligament reconstruction outcomes: a systematic review. Knee Surg Sports Traumatol Arthrosc 2015;23:752–62.

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2015 AAOS (JBJS)

- Lysholm > 75
- Full AROM
- Quad atrophy <2 cm
- Quad LSI >/= 85%, hamstring 100%
- Single leg press LSI >/= 90%
- Functional testing (hop tests) LSI >/= 85%
- Movement quality single leg squat, lateral agility/pivoting, drop jump, deceleration, hop testing

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2016 van Melick (BJSM)

- Movement quantity/quality
  - Strength test battery
  - Hop test battery
  - "Measurement of movement quality"
  - LSI >90% (100% if cutting/pivot sport)

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"Mack 2019"

- What I use:
  - No evidence of valgus with single leg squat, jump
    - At rest and under fatigue
  - Confidence (no instability): sprinting, cutting, jumping at full speed
    - Full ROM, strength, of quad
  - 90-95% contralat hop testing with **quality movement BILAT**
  - Quad index 90-95%
  - Baseline sport-specific fitness level and **progression through** sport-specific drills without instability

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Limb symmetry index

- USE CAUTION!
  - May overestimate knee function after ACLR (Wellsandt et al 2017)
  - Related to second ACL injury risk?

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LIMB SYMMETRY INDEX

- Or… did we not rehab well?
  - Meet ALL criteria? (Toole et al 2017)
    - Low proportion in young athletes (14%)
      - LSI
      - Single leg hop LSI
      - IKDC
      - Quad, hamstring strength

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Criteria based RTP

- Movement quality- look for these:
  - Valgus
  - Quad dominance
  - Decreased knee flexion (less than 40 degrees)

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Return to running

- Generally ~3 months
  - Complicating factors
    - Meniscal repair
    - Rate of recovery: effusion, strength, ROM
  - *CRITERION BASED- vs time based guidelines!

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Criteria for return to running

- Rambaud et al *BJSM* 2018
  - Median time RTR: 12 weeks post-op
  - Less than 20% used performance-based criteria

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Criteria for return to running

- Minimal knee effusion/pain
- Full ROM
- "Functional strength/control in daily activities" (MOON)
- Lateral tap-down test (step height individualized)
  - 90% uninvolved limb in 1 minute
- Leap and hold x20 reps without instability
- Form running drills with symmetrical form, no instability

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Criteria for return to sprinting

- Strength and power:
- Single leg jumping/landing with good control, no pain, instability
  - Hop tests >90%
    - Ground reaction force higher during max single leg jump vs max sprinting (Weyland 2010)

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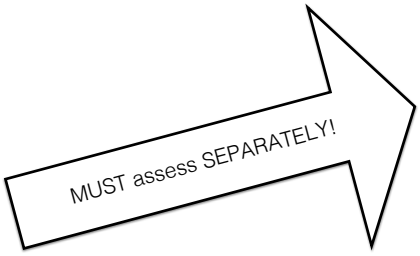
Sprinting progression

- Straight line sprinting
- Begin 50% intensity
- Emphasize technique

50

RETURN TO CUTTING



- Functional testing
- Motion Analysis
  - Jumping
  - Cutting/planting

- Knee valgus angles during drop jumps do not predict abduction moments during sidestep cutting
  - "Poor correlation" (p = 0.238)

(Kristianslund, Krosshaug 2013)

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CUTTING PROGRESSION

- Cutting
  - Lateral
  - 45 degree
  - 90
  - 180
- Movement quality

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CONTINUED

Clinical Examples

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CONTINUED

Progression

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Injury Prevention

- *Verhagen, 2013:* FIFA 11+ injury prevention program did not lower rate of injuries in adult male soccer players
  - However- cost per player and per injured player **lower** in intervention group

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Injury Risk Reduction

- *Grooms, 2013:* FIFA 11+ reduced overall risk and severity of lower extremity injury in college male soccer players
- *Daneshjoo, 2013:* FIFA 11+ improves performance on Illinois agility and vertical jump

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CONTINUED

PEP

- Santa Monica Sports Medicine Prevent Injury and Enhance Performance Program
  - Warm up, stretching, strength, plyometrics, agility
  - On field before practice, no equipment required
  - ~20 minutes; 3x/week

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CONTINUED

PEP

- Research supporting (Mandelbaum, Am J Sports Med, 2005)
  - 14-18 year old females
  - >1000 athletes intervention group (>1900 control)
  - Year 1: **88%** decrease ACL injury rate intervention grp
  - Year 2: **74%** reduction

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PEP

- Research supporting (Gilchrist, Am J Sports Med, 2008):
  - NCAA D1 females (61 teams, 1435 athletes)
    - 583 intervention
  - Intervention ACL injury rate 1.7x less (41% decrease)
  - Intervention athletes with history ACL injury less likely to have second injury vs controls

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FIFA 11+

- Warm-up program to improve strength, awareness, neuromuscular control
- Research (Soligard, BMJ, 2008)
  - 125 soccer clubs (Norway) over 8 months
    - 1892 females age 13-17
  - Intervention group significant lower risk overall injury

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CONTINUED

Concussion

- Brain injury
- *"A complex pathophysiological process affecting the brain, induced by biomechanical forces."*
  - *- Consensus statement on concussion in sport: Zurich, November 2012*
- Prevalence: 29% female soccer athletes

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CONTINUED

Concussion in Soccer

- Fuller et al, 2005:
  - Lost time concussion:
    - Men 3.5/1000 hrs
    - Women 4.1/1000 hrs

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CONTINUED

Concussion in Soccer

- Adolescent athletes
  - Women's soccer 3rd highest for concussion (following FB and Wrestling)
    - *Gessel LM, Fields SK, Collins CL, Dick RW, Comstock RD. Concussions among United States high school and collegiate athletes. J Athl Train 2007*
    - *Powel JW, Barber-Foss K. Traumatic brain injury in high school athletes. JAMA 1999*

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CONTINUED

Concussion in Soccer

- 55% involve aerial challenges; 33% with use of upper extremity, 30% with use of head *(Fuller, 2005)*
- 6-25% concussions associated in contact with ball *(Levy, 2012)*

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Concussion in Soccer

- Most cases at penalty area and midfield line (Levy)
  - Midfield line: heading off punt
- Goalkeepers at high risk
  - 80% report sustaining concussion

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Concussion in Soccer

- Gender differences? *(Colvin, et al 2009)*
  - Females soccer players report more symptoms than males
  - Longer-lasting headaches for females
- Soccer players with previous concussion: significantly worse on ImPACT

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CONTINUED

Signs and Symptoms

- Headache: most common
- Loss of consciousness
- Feeling in a "fog"
- Difficulty remembering
- Behavioral changes (irritability, rapid changes in mood, exaggerated emotions,
- Aggressiveness, depression, decreased tolerance to stress, etc…)
- Nausea/vomiting
- Difficulty with balance
- Pupils that are enlarged or not equal in size
- Double or blurred vision
- Slurred speech
- Difficulty falling asleep
- Excessive drowsiness

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CONTINUED

Management

- Merkel DL, Molony JT Jr. Medical sports injuries in the youth athlete: emergency management. Int J Sports Phys Ther. 2012 Apr;7(2):242-51.

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CONTINUED

Management

- If you suspect a concussion in an athlete:
  - Do not allow return to any sporting event
  - Allow rest until resolution of symptoms.
    - Extra time to sleep
    - Frequent naps
    - Minimize distraction (TV, internet, reading, phone)
  - Unnecessary to wake athlete up every hour.
    - Disturbs sleep patterns, interferes with healing
  - Avoid anti-inflammatory med
  - **Do not leave the athlete alone** after the injury. Monitor symptoms closely
    - If status worsens - go to the ED

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CONTINUED

Concussion RTP: Team Approach

- MD
- PT
- ATC
- Neuro-Psych
- Parent
- Coach, school administration- if needed
- Athlete

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When to Initiate Training?

- Symptom- free
  - At rest
  - During all mental activities (full day of school)
- Normal neurophysical examination (MD)
- Normal neurocognitive examination (MD, ImPACT)

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Monitoring Symptoms

- Graded symptom checklist
  - Pre and post-exercise
- Borg Rating: Perceived Extertion (RPE)
- Heart Rate

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BORG Scale

- 10 grade scale
  - 0 = "nothing"
  - 10 = very very strong, almost maximum
  - (over 10 = max)

(*Borg, 1982)*

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General Guidelines

- Step-wise progression
- Criteria to advance to next step:
  - Asymptomatic with activities in current phase
- Phase duration: 1 day

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CONTINUED

Return to Play

- Broshek, 2005: *"Return-to-play decisions and concussion management must be objective and made on an individual basis, including consideration of factors such as patient sex rather than relying on a one-size-fits-all guideline"*

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CONTINUED

Return to Play

- American Medical Society for Sports Medicine Position Statement: Concussion in Sport (2013)
  - Short- term risk of premature RTP:
    - Decreased reaction time leading to increased risk of repeat concussion or other injury
  - Long- term risk: long-term neurologic sequelae, chronic cognitive dysfunction

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Heading in Soccer

- Modeling of head/neck motion: neck muscles adopt stiffening effect during heading
  - *Burslem 1988*
  - *Lees 1998*
  - *Riches 2005*
- May help absorb kinetic energy of ball vs head
  - Goal to minimize acceleration of head
- Neck muscles act in viscoelastic mechanism- shock absorber *(Ledet 2013)*

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Heading in Soccer

- Gutierrez et al, 2014:
  - Significant negative correlation between neck strength and header acceleration
    - Those with weaker necks → greater impact

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Heading in Soccer

- Neck strength imbalance related to increased impact during heading *(Dezman et al)*
- Increased neck strength lowered magnitude of head acceleration *(Viano et al)*
- Differences in coordination may be responsible for higher acceleration by novices *(Kerr 2004)*

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Heading in Soccer

- *Eckner 2014:* Greater isometric neck strength and anticipatory activation decreased velocity after impulse loading
  - "Bracing for impact" and greater neck strength can reduce magnitude of head's kinematic response

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Mechanism of Heading

- Pre-impact
- Ball contact; with forehead (NOT top of head)
- Follow through

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Muscle Actions

- SCM activated 280-500ms prior to ball impact
  - Become inactive at time of impact
- Trapezius activated prior to impact
  - Remain active after ball departure
  - Stabilize head during follow through

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Trunk Muscle Action

- Trunk, hip extension needed for setup
- Sunami 2008: Erector spinae active after impact to slow trunk flexion
  - External oblique active for heading ball laterally

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Return to Heading

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CONTINUED

Trunk Control

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CONTINUED

Trunk Control

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Return to heading

- Start with beach ball/toy ball
  - Seated
  - Kneeling/Single leg kneeling
  - Standing
  - Jumping
- Progress to deflated ball
- Progress to regulation ball

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Heading progression

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Heading progression

Bilateral kneeling

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Heading progression

Single leg kneeling

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Heading in Soccer

- US Youth Soccer:
  - New heading recommendations (2016)
    - *"A player age 10 or younger may not head the ball no matter which age group the player plays."*

91

Hamstring injuries

- NCAA sports (Dalton 2015):
  - Men's football 35.3%
  - Men's soccer 9.9%
  - Women's soccer 8.3%

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Hamstring injuries

- "Significantly greater extent of injury" when dominant leg involved
  - Elite mens soccer- Swedish first league (Svensson 2016)
- Mens professional soccer (UEFA):
  - Training-related hamstring injury rates increased since 2001
  - 4% annually (Ekstrand 2016)
- Match-related injury rates stable

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Hamstring injuries

- Two types of acute sprain (Askling 2012)
  - High speed running injury
    - Long head biceps femoris
  - Stretched at extreme joint position
    - High kicking, slide tackling, sagittal split
    - Free proximal tendon of semimembranosus

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Factors in recovery

- Longer return to play:
  - Slow stretch injury
  - Central tendon disruption biceps femoris
  - Close proximity to ischial tuberosity
  - Increased ROM deficit with hip flexed at 90°
  - Time to first consult >1 week
  - Increased pain on visual analog scale
  - >1 day for painfree ambulation after injury

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Outcomes: recurrence

- Higher incidence with…
  - Biceps femoris injury (Hallen 2014)
  - Active knee extension deficit
  - Number of previous hamstring injuries
  - Isometric knee flexion force deficit at 15°
  - Discomfort on palpation after RTP (De Vos 2014)

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Outcomes: recurrence

- Second injury usually more severe
  - Time away from sport doubles (Brooks 2006, Koulouris 2007)
- Previous strain strongest risk factor for recurrence (Engebretsen 2010)

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Outcomes: strength

- Reduced eccentric hamstring strength after return to play (Brughelli 2010, Lee 2009, Opar 2013, Sanfilippo 2013, Sole 2012)
  - Factor in high recurrence rate?
  - Due to prolonged neuromuscular inhibition after injury?

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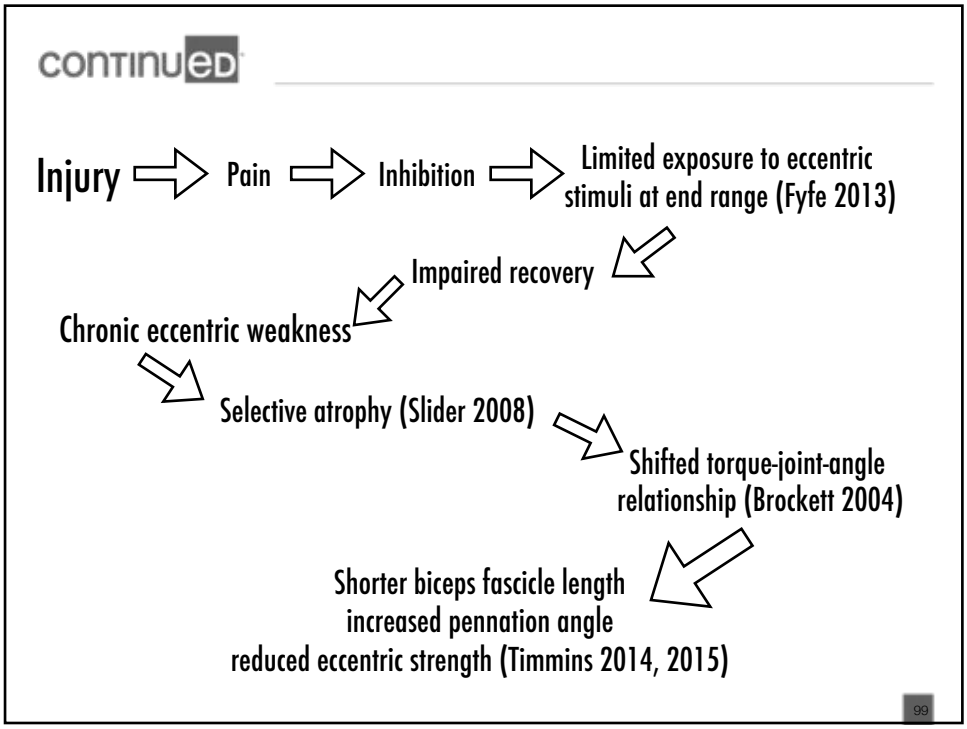

SOCCER-SPECIFIC strength

- Eccentrics: Nordics
  - Caution- biceps femoris activity decreases with fatigue
    - 1 x 5 reps - amateur soccer (Marshall 2015)
- Lower incidence of hamstring strains Icelandic/Norwegian soccer teams in season (Arnason 2008)
- Danish soccer: 52 injuries control group; 15 intervention (Petersen 2011)

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SOCCER-SPECIFIC strength

- Eccentrics
  - Perform after training to decrease injury risk (Lovell 2016)
  - Hamstring EMG declines; decreased eccentric hamstring peak torque during soccer-specific exercise.

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Functional strength

- Assess/correct
  - Lumbopelvic control
  - Limb asymmetry L vs R
  - Previous injury history
  - Functional strength/control

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RETURN TO PLAY PROGRESSION

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Return to Play Progression

1. Return to soccer-specific running
2. Return to non-contact drills
3. Return to soccer-specific, controlled contact situations
4. Return to competition

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Return to Soccer-Specific Running

- Restoration of match fitness **critical** for safe return to play
  - Minimize negative effect of fatigue
  - Safe progression of running to allow gradual return to impact activities
    - Articular cartilage injuries
    - Fractures

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Return to Soccer-Specific Running

- Distance running progression
  - 3 sessions per week of running
  - Pool or elliptical on alternate days
- Increase **duration** before intensity
- Frequency progressed last (to 5 sessions/week)

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Distance Running Progression

Level 1	Run/walk (3x/week): 2 min run/3 min walk x4 cycles; total 20 min *(HR MAX 35-59%, VO2 MAX 30-49%, RPE 10-11)*	On alternate days: pool/elliptical interval program •30-45 min: • 5 min warm up • 30 second sprint/1 min rest (repeat) • 5 min cool-down
Level 2	Increase to 3:2, then. 4:1 *(HR MAX 35-59%, VO2 MAX 30- 49%, RPE 10-11).*	Continue pool/elliptical program on alternate days
Level 3	20 minute continuous run *(HR MAX 35-59%, VO2 MAX 30-49%, RPE 10-11)*	Continue pool/elliptical program on alternate days

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Distance Running Progression

Level 4	Increase to **4** sessions/wk *(HR MAX 35-59%, VO2 MAX 30-49%, RPE 10-11)*	Continue pool/elliptical program on alternate days
Level 5	**25** minute run x4 sessions *(HR MAX 35-59%, VO2 MAX 30-49%, RPE 10-11)*	Continue pool/elliptical program on alternate days
Level 6	**30** minute run x4 sessions *(HR MAX 35-59%, VO2 MAX 30-49%, RPE 10-11*	Continue pool/elliptical program on alternate days

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CONTINUED

Distance Running Progression

Level 7	Increase intensity- 30 min run x4 sessions *(HR MAX 60-79%, VO2 MAX 50-74%, **RPE 12-13**)*	Continue pool/elliptical program on alternate days
Level 8	Increase intensity- 30 minute run x4 sessions *(HR MAX 80-90%, VO2 MAX 75-84%, **RPE 14-16**)*	Continue pool/elliptical program on alternate days
Level 9	Add **5th session** of 30 minute runs x2 weeks	

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CONTINUED

Return to Non-Contact Training

Passing, shooting, footskills, fitness

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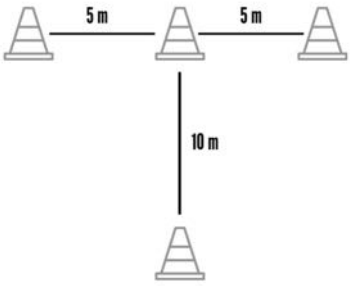
Soccer Specific Criteria

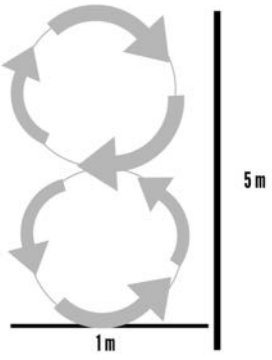
- Modified T-Test at 75% full speed with symmetrical change of direction to each cone



111

Soccer Specific Criteria

- Figure-8 hop within 90% of uninvolved side
  - Requires forced pivoting motions *(Ortiz 2005)*
  - Jump with single leg around a 5 m long figure-8 path for 2 consecutive laps



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Activities

- Soccer-specific fitness: interval training
- Soccer drills
  - Footskills
  - Passing
  - Shooting

113

Interval Training

- Mixed Intensity Interval Endurance Drill
  - Improved aerobic fitness in female soccer players

- Clark JE. The use of an 8-week mixed intensity interval endurance-training program improves the aerobic fitness of female soccer players. J Strength Cond Res 24(7):1773-1781
- Ferrari Bravo D, Impellizzeri FM, Rampinini E, Castagna C, Bishop D, Wisloff U. Sprint vs Interval Training in Football. Int J Sports Med 2008; 29:668-674.

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Mixed Intensity Interval Endurance Drill

- 6-minute cycle:
  - 30 sec submax jog
  - 30 sec **90-100%** max effort
  - 60 sec submax jog
  - 60 sec **80-90%** max effort
  - 90 sec submax jog
  - 90 sec of **70-80%** max effort

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Mixed Intensity Interval Endurance Drill

- Increase by one cycle each week
- Add cones to train change of direction as needed

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CONTINUED

Repeated Sprint Training

- "Ability to recover and reproduce performance in subsequent sprints"
  - Less than 10s (usually 2-3s)
  - Recovery 60 seconds or less
- Performance decrements due to fatigue inversely correlated to initial sprint performance

Girard O1, Mendez-Villanueva A, Bishop D. Repeated-sprint ability - part I: factors contributing to fatigue. Sports Med. 2011

Bishop D1, Girard O, Mendez-Villanueva A. Repeated-sprint ability - part II: recommendations for training. Sports Med. 2011

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CONTINUED

Repeated Sprint Training

- Shuttle Sprint Drill
  - Develops repeated sprint ability
  - 180-degree cut

Ferrari Bravo D, Impellizzeri FM, Rampinini E, Castagna C, Bishop D, Wisloff U. Sprint vs Interval Training in Football. Int J Sports Med 2008; 29:668-674.

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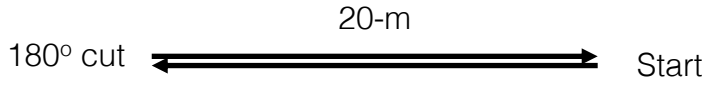
Shuttle Sprint Drill

- 3 sets of 2 shuttle sprints of 20-m at 50-75% speed
  - 180° direction change every 20m



- 20 sec passive recovery between sprints
- 4 min passive recovery between sets

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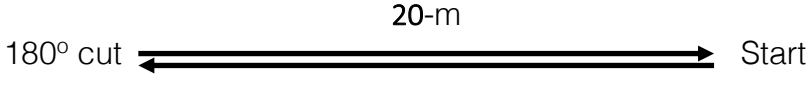
Shuttle Sprint Drill

- Increase to 3 sets of 6 sprints
- Increase to 80-90% full speed
- Increase to 3 sets of 2 shuttle sprints of 40-m at 50-75% speed



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Non-Contact Drills

- Footskills:
  - Progress technique: inside, outside of foot
  - Increase speed
  - Progress straight-plane to multi planar
  - Rotation/change of direction with ball
    - Receive pass then dribble

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Footskills

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Footskills

- Footskills circuit: 1 min each; 1-3 rounds
  - Pull back, outside-outside
  - Pull back, inside-outside
  - Behind leg, outside-outside
  - Behind leg, inside-outside
- Increase number of touches per min

123

Passing

- Progress velocity and distance
- Deceleration training with run to ball, plant, and pass

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Shooting

- Begin holding ball in hands
- Progress to ball on ground
- Use rolling ball to assist with increasing distance
  - Progress back to ball on ground at each increase in distance

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Corner Kicks/Free Kicks

- Progress as previously described

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Skills Assessment

- Heading for distance
- Long pass
  - Hit 5x5 meter square target area from 25 m or less
- Juggling: as many touches as possible in 30 sec
- "Hit-the-post" from the penalty spot

Asplund, J. Measuring soccer technique with easy-to-administer field tests in female soccer players from four different competitive levels. Perceptual & Motor Skills: Physical Development & Measurement. 2014, 119, 3, 961-970.

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Return to Controlled-Contact Situations

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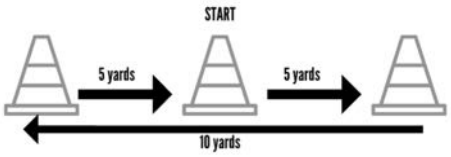
Criteria to Initiate

- Satisfactory fitness testing
- Pro agility drill with symmetrical form to each cone and without instability
  - If baseline available: within 90% baseline time



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Fitness Testing

- Current standard for performance testing in soccer (healthy athletes):
  - Repeated Shuttle-Sprint Ability (RSSA)
    - Impellizzeri 2008, Rampinini 2007
  - Yo-Yo Intermittent Recovery Test (YYIR or "Beep Test")
    - Krustrup 2006

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Fitness Testing

- **Intermittent high-intensity endurance** poorly associated with **repeated-sprint performance**
- Should consider both YYIR and RSA in test batteries

Chaouachi 2010

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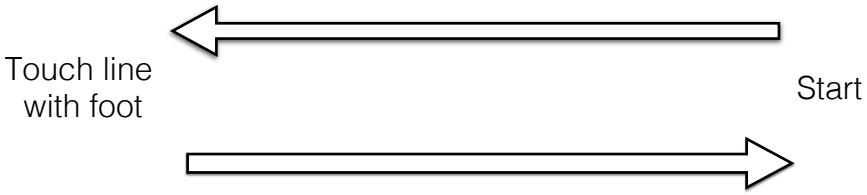
RSSA

- Six, 40m (20 + 20 m) shuttle sprints
- 20 sec passive recovery between sprints



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Yo-Yo Intermittent Recovery

- Large correlations observed between YYIR1 and YYIR2 test performances in high-level soccer players *(Ingebrigsten 2014)*

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Yo-Yo Intermittent Recovery

- Test result: distance covered when subject fails to reach finish line twice
- Positional differences:
  - Defense and midfielders with better performance than attackers
- Can estimate VO_{2max} *(Bangsbo 2008)*

Yo-Yo IR1 test:VO_{2max} (mL/min/kg) = IR1 distance (m) × 0.0084 + 36.4
Yo-Yo IR2 test: VO_{2max} (mL/min/kg) = IR2 distance (m) × 0.0136 + 45.3

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Yo-Yo Intermittent Recovery

- YYIR1: high discriminative ability to distinguish elite and non-elite youth soccer *(Deprez 2014)*
  - Significantly related to a number of match activities *(Castagna 2010)*
  - Due to this association, YYIR1 *"Should be considered in talent selection and development of players"*

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Special Considerations for Goalkeepers

- Explosive training
  - Med ball drop jump
  - Med ball throws
  - Lunge jump
  - Lateral jump

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Special Considerations for Goalkeepers

- Speed and agility
  - Pro-agility with burpee
  - Diagonal side shuffle
  - 4-cone shuffle

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Special Considerations for Goalkeepers

- Reaction training
  - Mirror drill
  - Turn around defense

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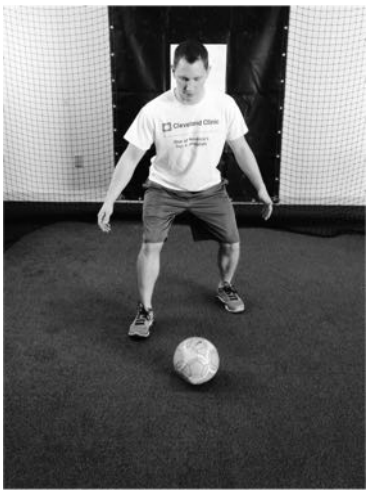
Controlled-Contact Drills

- Defensive, "athletic" position
  - Body turned 45 degrees
- Reaction drills



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Controlled-Contact Drills

- Slide tackling
  - Stationary ball
  - Progress contact situations in clinic

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Slide Tackle Progression

- Maintain low center of gravity

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CONTINUED

Controlled-Contact Drills

- Teammate drills
  - Shield ball
  - Receive pass while shielding teammate
  - Progress to random passes

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CONTINUED

Controlled-Contact Drills

- Compete for ball with teammate
  - Begin with controlled pass on ground
  - Progress to random passes
  - Progress to ball in the air

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Return to Competition

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Progression

- Return to limited-contact scrimmage situations (all-time offense)
- Return to small-sided games with contact
- Return to full-field scrimmages
- Competitive match play
  - Increase duration of time on field

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"All Time Offense"

- No pressure from defenders
- Involvement in match situations without contact
  - Decision making
  - Movement on and off ball ("check to and from")
- Limit player to "two touches"
  - Increases mental demand

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Small-Sided Games

- Small-sided games elicit greater acceleration/deceleration load than generic running
- Minimal heading situations (chances for increased contact)
- Also shown to improve agility with ball ("match-relevant")

(Ade 2013, Owen 2013, Chaouachi 204)

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