Conditioning and Injury Prevention in Youth Sports

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“Participation in organized sport does not seem to ensure an adequate level of physical activity”

Youth Sports

“Poor physical fitness, in addition to having negative health consequences, seems to be a risk factor for sports-related injury.”

Injury Surveillance

• FIFA established F-MARC
What we do know

ACL (non contact) injury prevention in young women

Neuromuscular training
Plyometric training
Proprioceptive training

MODIFIABLE risk factors

hip/knee posture on landing
hamstring-to-quad strength ratios

Prevention Strategies

- General Fitness
- Specializing after puberty
- Preseason training
- Kids control intensity
- Do not emphasize win
- Match opponents appropriately

- Strict rules, implement
- PPE
- Warm Up, Cool Down
- 10 reps good form
- 10% per week increase
- Rest

Factors Contributing to Overuse Injuries

INTRINSIC

• Immature skeleton- susceptible growth cartilage
• Growth Spurts
• Level of conditioning
• Previous injury
• Anatomic factors- individualized

INTRINSIC (continued)

- BMI
- Postural control
- Strength
- Muscle –tendon imbalance
- Joint stability
- Proprioception and coordination
Factors Contributing to Overuse Injuries

EXTRINSIC

- Training Volume
- Equipment
- Technique
- Psychological
USA Water Polo ODP
Philosophy

Our mission is “to build a foundation, prevent injuries, and improve performance.”
6 Steps of a Functional Foundation

1. Functional evaluation
2. Core strength
3. Dynamic and Static stretching
4. Balance and proprioception
5. Eccentric training
6. Multi-planar movements and strength training exercises
#1 Functional Evaluation

- **Why?** It *personalizes the programs* for each person and identifies tendencies for a sport, work place, et etc.

- **Performed to identify hypertonic muscles and hypotonic muscles with dynamic movement patterns, static posture, and active range of motion for joints.**

- There are many types of functional evaluations—USA Water Polo ODP uses combination of NASM-PES, mentor Dr. Joe LaCaze and Dr. Vladimir Janda functional evaluation approach. We also believe in the joint-by joint approach by **Grey Cook** and Mark Boyle.

- No need to reinvent the wheel. However, each one of us takes the philosophy of a founding father and add our own flare make it our own.
Tested 200 USA Water Polo Athletes

• Documented static observation of posture
• Listed any present or pre-existing injuries and hand dominance
• Measured internal and external rotation of shoulders and hips to identify ROM
• Performed Movement Patterns:
  – Full Overhead Squat
  – Modified Push-up
  – Side-Lying Hip Abduction
# Functional Evaluation Test

<table>
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<tr>
<th>Name:</th>
<th>DOB:</th>
<th>R L Handed</th>
<th>Height:</th>
<th>Wing Span:</th>
<th>Past Injuries:</th>
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<th>IR Shoulder</th>
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<td>ER Shoulder</td>
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## Hip Abduction Movement Patterns

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- Excessive shaking or torsion
- Hip hiking before 30° abduction
- Slight hip flexion w/ IR
- Slight hip flexion w/ ER
- Slight hip flexion w/ knee flex
- Decreased abduction ≤6” (check hypertonic rectus)
- 5 second hold at end range

## COMMENTS:

## Push-Up Movement Pattern (modified, keep arms close to body)

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- Winging
- “Kissing” scapula/caving of T/S
- Shoulder elevation

## COMMENTS:

- Static weight bearing

## Full Squat (with hands overhead)

| | Balanced throughout ROM |
| | Able to fully deep knee bend past 90° flexion |
| | Maintains L/S lordosis through co-contraction of L/S erectors |
| | Knees are even |
| | Foot placement is equal |
| | Both heels are flat on the ground |
| | Arms extended close at body and elbow straight |

## COMMENTS:
Posture
What We Found...

• Common tendencies in water polo players
  – Posterior chain weakness, especially glute max
  – Upper Crossed Syndrome with breathing and TMJ issues
    • Tight posterior shoulder capsule of dominant shoulder and bi-lateral scapula winging/flaring
    • Extreme forward head carriage
  – Lower Crossed Syndrome
    • Hypertonic external oblique and limited internal rotation of the hip on the non-dominant side
    • Hypertonic rectus femoris and psoas of dominant arm
    • On the side of the dominate hand, AS of pelvis and hypertonic posterior shoulder capsule
    • Limited internal hip rotation on the non-dominant side and limited external hip rotation on the dominant side.
  – Overall...altered firing patterns because of muscle weakness
    • Rhomboids, middle trapezius, lower trapezius, gluteus medius, gluteus maximus, serratus anterior, deep neck flexors, and inner abdominals.
Common Injuries

- Rotator cuff strain
- Labral tear/FAI in hip
- Lumbar sprain/strain
- Groin strain
- Patellofemoral Pain Syndrome
- Concussion
- Cervical Spain/Strain
- Sports hernia/rectus abdominis strain
- Shoulder impingement
- IT Band Syndrome
Functional Evaluation + Your program

• Take the information from your evaluation and begin the program modification...
  - Prescribe exercises and stretches that will isolate and eliminate the problem(s) identified in your evaluation.
  - If you are working with a sport team, discuss your findings with the medical team so that it can be incorporated across the board...

• Coach- Focus on engaging core in sport-specific drills, work on the basic fundamental of each position, incorporate breathing techniques

• Nutritionist- Discuss hydration, weight loss or weight gain, proper nutritional advice for performance goals and recovery

• Strength Coach- add in certain areas to strengthen and/or lengthen based on functional evaluations and position-specific needs
Core Strengthening

- Two Systems
  - Stabilization System
    - Transverse abdominis
    - Internal oblique
    - Hip external rotators
    - Lumbar multifidi
    - Pelvis floor muscles
    - Diaphragm
  - Movement System
    - Latissimus dorsi
    - External Oblique
    - Erector spinae
    - Iliopsoas
    - Hamstrings
    - Hip adductors
    - Glutes
#3 Stretching

- Flexibility is important because the loss of flexibility overall or in a specific joint can result in reduction of movement efficiency and may increase risk of injury during activity (Wenos and Konin 2004)
- To avoid deficits in flexibility, it is important to incorporate stretching as a key element in an athlete’s program for injury prevention and sport performance
- Cook and Boyle’s joint-by-joint approach
- The two types of stretches that are commonly used for water polo are: static and dynamic stretching
Dynamic vs. Static Stretching
Focus on ankles, hips, mid back and shoulders

• **Dynamic**
  - Before practice:
    - **Target each joint throughout entire range of motion.**
    - Challenges flexibility while stressing ROM
    - Sport specific movements
    - 10-12 reps of each exercise (or 25 yards)
    - Approx 12-15 exercises
    - Increase heart rate
    - Build into more explosive movements.
  - Before competition
    - May be an abbreviated version of practice routine

• **Static**
  - Hold muscle at lengthened position for 30-90 sec, rest 2-10 sec
  - 2-3 sets
  - Reduces performance of powerful activities up to one hour after stretching (McNeal and Sands, 2001)
  - Perform after practice or competition; mornings and before bed
Dynamic Warm Up Tips

• Do some type of warm-up before dynamic stretching (cardio, jumping rope, or jogging)
• Can either be performed on the pool deck, in the pool, or in an area that is open. The length of movement can vary (usually 25 yards).
• Actively move body part(s) throughout entire range of motion to end range
• All the muscles should work together with core engaged
• Do NOT stretch into pain
• Movements are a controlled pattern with core always engaged
#4 Balance and Proprioception

- Three planes of motion
  - Frontal
  - Sagittal
  - Transverse

- Progression in training is key
  - Stable surface before unstable surface
  - Use two legs before single leg exercises

- Challenge the patient/athlete in ways their normal activities would not challenge them

- Sport-specific training is VERY important
  - Example: Water polo athletes do not compete on stable surfaces, so unstable surface training must be incorporated in all three planes
Balance & Proprioception Exercise Examples

- **Exercises**
  - Stork Stand, 3 x 10 seconds
  - Stork Stand with head flex/extended, 2 x 10 seconds
  - Stork Stand with head rotation, 2 x 10 seconds
  - Stork Stands with lateral head bending, 2 x 10 seconds
  - Shoulder ABC’s @ 90 degrees abduction, 2 x’s ABC’s
  - Single leg throwing in the mirror, 2 x 10 times
  - Track starts in the mirror, 2 x 10 times

- **Key points:**
  - Perform balance on each leg or arm
  - Start out with 10 seconds balance and then increase time.
  - Can advance to unstable surface (foam, trampoline, or dynadisk)
  - Progress from head movement to body movement
  - Progress from eyes open to eyes closed
#5 Eccentric Training

- **Eccentric Muscle Contraction**
  - Muscle contraction while an external force causes the muscle to lengthen
  - The mechanism of many musculotendinous injuries
- **Often left out of resistance training**
  - Muscles fatigue
    - Repetitive eccentric contractions in competition
    - Fatigue leads to changes in biomechanics which lead to injury
- **Teach proper technique**
  - Jumping-Landing
  - Tandem Tubing
Eccentric Training

- **Jump Rope**
  - Great warm-up
  - Concentric and eccentric contractions
  - Increase blood flow to entire body
  - ACL Injury Prevention
  - Proprioception
  - Strength

- **Tandem Tubing**
  - Performed with partner
  - Muscular endurance of shoulders and core
  - Constant tension in tubing is required
  - Focuses on concentric and eccentric muscle contractions
Eccentric Training
#6 Multi-planar movements and strength training exercises

- Incorporate Steps 1-5, especially the functional evaluation feedback
- Limitless exercises that can be preformed with body weight and then progress with weight and/or resistance
- Coupled exercises that incorporate isometric holds and also include explosive power
- First develop body balance and then move into sport specific explosive movements that are performed at game speed
Transiting into Multi-Planar Movements

- Break down the proper squatting technique and proper push up technique before adding multi-planar movements

- Squatting- Utilize a mirror to develop proper symmetry
  - Engage the intrinsic muscles of the feet
  - Engage the core in pelvic neutral with proper posture (shoulder blades down and in)
  - Push the hips back before bending knees for a controlled decent
  - Descend without knees over toes-try to lower below 90 degrees with lower leg control and balance

- Depending on the age and experience with strength training, prescription will vary
  - Younger athletes and less experienced patients start with body weight exercises and move to more advanced movements with weight
Resources

• FIFA.com “+ 11”
  Http://www.fifa.com/aboutfifa/video/
  video=1121815/index.html?cid=sendemail
• FINA.org
• STOPsportsinjuries.com
Summary

Injury Surveillance

Sport Specific Conditioning - just not too soon

Dynamic Stretching before competition

Strength Training is OK

Functional Movement Screening

Pay attention to kids' ankles, gluteals, posture

Transverse plane ... don't forget!
USA Women’s Olympic Gold Medal Champions London 2012