Biomechanical Analysis for Prevention of Injury in Youth Baseball & Softball

Jennifer Allen, PT, DPT, OCS, SCS, CHT
Author

Medical/Clinical:

• Jennifer Allen, PT, DPT, OCS, SCS, CHT
  – Doctor of Physical Therapy
  – Board Certified Clinical Specialist in Orthopaedic Physical Therapy
  – Board Certified Clinical Specialist in Sports Physical Therapy
  – Certified Hand/Upper Extremity Therapist

  – ASA Softball Coach
  – Member National (Baseball) Pitching Association
  – Former Collegiate Softball Player
Biomechanics

Definition

• Science field that applies the laws of mechanics and physics to human performance and motion

• Physical Therapist Role:
  – Rehabilitation Injury & Prevention
  – *Identify the “Hows and Whys of Injury”*
  – *Restore optimal Biomechanics*
  – Return Player/Patient to Sport Activity
Introduction

Why Biomechanics?

• Increase incidence of injuries to the Elbow/Shoulder in Young Players

• Specific Return to Play Criteria

• Prevention of Injury/Re-injury

• Performance Enhancement Strategies
What We Know

So Far…

• Injury Risk Factors
  – High Pitch Counts, Inadequate Rest Periods
  – Biomechanical Problems (Pitching Mechanics)
  – Loss of ROM- IR/ER/Horizontal Adduction
  – Rotator Cuff Imbalance (ERs Weaker Than IRs)
  – Pitching more than 8 mos/year
  – Poor Neuromuscular control of core
What We Know

Sleep Info

- *** Teens who slept at least 8 hrs a night were 68% less likely to suffer a sports injury
- In one study, research showed the biggest factor for predicting sports injuries in High School Athletes was hours of sleep per night
- Optimal is 8-9.5 hrs/night
- Fatigue, growth, repair & recovery, cognitive skills/concentration

(2012, American Academy of Pediatrics)
Joint/Muscle Biomechanics

Beyond the Shoulder...

• Evaluation:
  – General Posture
  – Foot/Ankle
  – Lower Chain Biomechanics
Joint/Muscle Biomechanics

Beyond the Shoulder…

- Evaluation Continued
  - Cervical, Thoracic & Lumbar Spine
  - Hips
  - Pelvis
Joint/Muscle Biomechanics

Shoulder, Scapulo-Thoracic, Elbow…

• Shoulder

• Scapular Position, Movement

• Elbow, Wrist and Hand
Functional Biomechanics

Putting It All Together

• Video Movement Analysis
Functional Biomechanics

Baseball Pitching

Fig. 1. Pitching phases and key events (adapted from Fleisig et al.,[12] with permission). ER = external rotation; IR = internal rotation; max = maximum.
Functional Biomechanics

Softball Pitching

Windmill Pitching Phases

Windup (PHASE 1)
6 o'clock (PHASE 2)
3 o'clock (PHASE 3)
12 o'clock (PHASE 4)
9 o'clock (PHASE 5)
Follow-through (PHASE 6)

Ball Release
Functional Biomechanics

Observe High Speed, Frame by Frame

• Examples: Wind Up (Balance, etc.)
Functional Biomechanics

Putting It All Together

• Examples: Hip Position with Stride
Functional Biomechanics

Putting It All Together

• Examples: Knee Flexion Angle During Contact
Functional Biomechanics

Putting It All Together

• Example: Stride Length (Hips vs Arm Power)
Functional Biomechanics

Putting It All Together

• Example: Glove position to midline
Functional Biomechanics

Putting It All Together

• Example: Top of Arc Position
Functional Biomechanics

Putting It All Together

• Example: Stance Leg at Release (Back Pain)
Functional Biomechanics
When It All Falls Apart… (50-Cent)
Musculoskeletal Evaluation
Blake Eager- Former MLB NY Mets Pitcher
Treatment & Prevention Strategies

Comprehensive Management

1. Treat the symptom areas (shoulder, elbow)

2. Address the **Dysfunction (Cause)**
   - Strength, balance, mobility problems, skill related dysfunction, Proprioception
   - Look at total body
   - Correcting Dysfunction will eliminate pain
   - Decrease chance of Re-Injury
# Recap of Evaluation/Intervention

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<td>Video/3D Biomechanics</td>
<td>Evaluate Specific Injury</td>
<td>Integrate Findings</td>
<td>Address Findings Globally</td>
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<td>- Tissue Specific</td>
<td>- Are Physical Findings Restricting Function?</td>
<td>- Treating Shoulder and Elbow Alone is treating symptoms</td>
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<td>- Fix the “Why”, Not just the “What”</td>
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Elite Baseball/Softball Programs

Bodycentral Physical Therapy-Ultimate Sports Asylum

• Evaluation- Musculoskeletal Biomechanics
  – By a Board Certified Sports Clinical Specialist
    • 3 SCS PTs at Bodycentral PT (19 in State of AZ)
  – Skills Assessment by Blake Eager/Kenzie Fowler

Video/Movement Analysis/3D Analysis
  – 3 camera HD motion analysis
  – 1200 frames per second +

• Putting it All Together
  – Educate the athlete, Re-build, Re-train
Baseball-Specific Skills Trainer:

- Blake Eager- Former MLB pitcher NY Mets
  - Olympic Baseball Coach Swedish National Team
  - HS Baseball Coach, Catalina Foothills

Founder: Hills Baseball
HillsBaseballAZ.com
Softball-Specific Skills Trainer

- **Kenzie Fowler** - Former University of Arizona Pitcher
- Pac-12 Networks Softball Analyst
  - USA Softball Player of the Year Finalist
  - NFCA All American
  - All Pac-10
  - Pitching Coach
References

Thank you J&L Photo for U of A Photos

Questions?