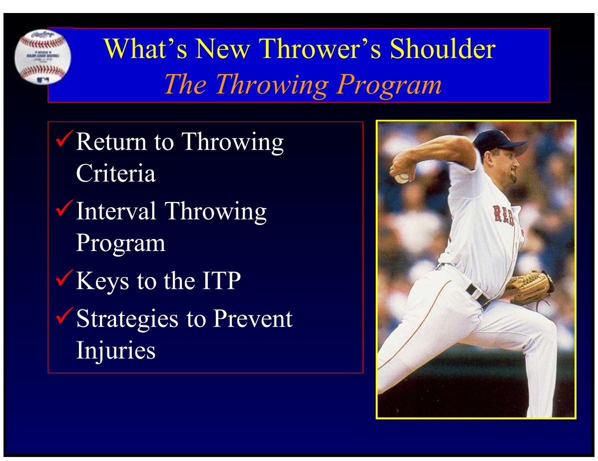
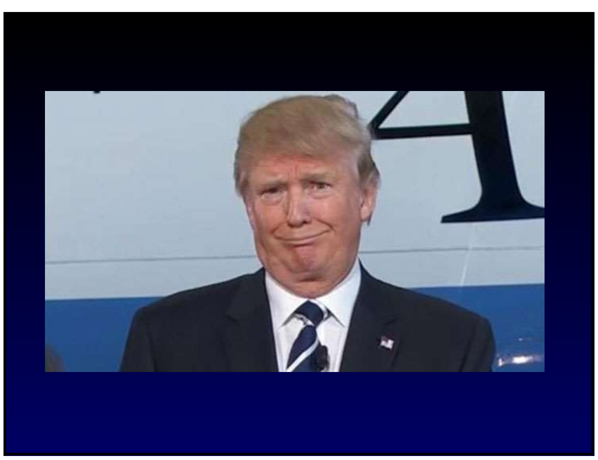

Recent Advances
2018
What's New in The Rehabilitation of the Overhead Thrower: Criteria to RTP
Kevin E. Wilk, PT, DPT,FAPTA
CSM
CHAMPION SPORTS MEDICINE
ASMI
RAYS


"Bummer of a birthmark, Hal."


What's New Thrower's Shoulder
The Throwing Program
✓Return to Throwing Criteria
✓Interval Throwing Program
✓Keys to the ITP
✓Strategies to Prevent Injuries


LY51 ZSP



## The Overhead Thrower
*Introduction*

- *Highly skilled athlete*
- *Requires flexibility, muscle strength, coordination, synchronicity & NM efficiency*
- Proper throwing mechanics
- Proper training program

***Injuries Are Common to the Throwers Shoulder & Elbow***

***Tremendous stresses & velocities***

## The Overhead Thrower
*Introduction*

- Overhead throwing motion
- Extraordinary demands on shoulder & elbow joint
  - *Fastest human movement – 7,230 o/s*
  - *Late cocking to ball release 0.03sec*
- Tremendous forces generated
  - *Anterior displacement 0.5 x BW*
  - *Distraction forces 1 x BW at ball release*

*Fleisig et al: Am J Spts Med '95*
*Fleisig et al: J Biomech '99*

## Thrower's Shoulder
*Key Points*

FACT

- ✓ Pitchers sustain injuries at the highest rate
  - ✓ *61% of all team injuries pitchers compared position players*
  - ✓ *>72% of all pitchers injuries are to their shoulder/elbow*
- ✓ Specific risk factors increases injuries
  - ✓ *Pitching when fatigued, or pitch too much (volume), improper throwing mechanics, or max effort - all increase injury risk*
- ✓ GIRD & GERI is predominantly due to boney adaptations
  - ✓ *~83% boney & ~17% due to soft tissue*
- ✓ Maintaining motion in throwing shoulder when healthy isn't difficult
- ✓ Specific exercises & stretches are important – maintain !

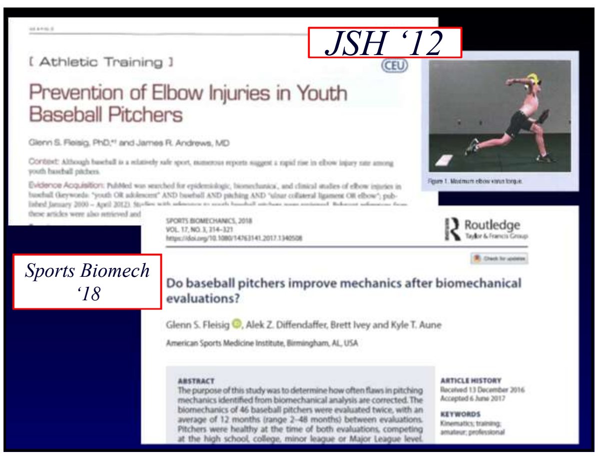
## Return to Play Criteria
*Objective Test Criteria*

- Criteria to initiate:
  - Interval throwing program
  - Return to play criteria

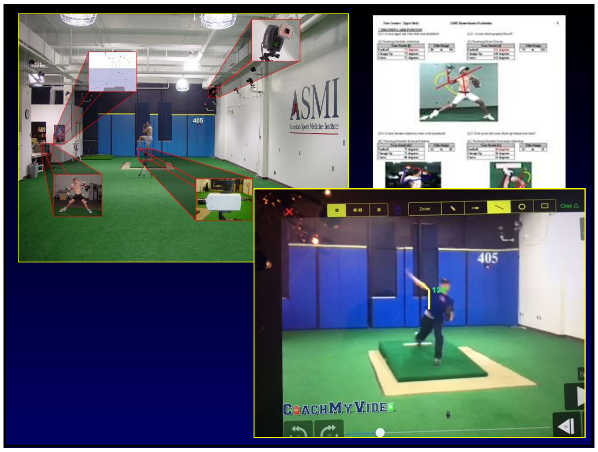

## Rehabilitation of Overhead Athlete
*Rehab Plan*



Astros


JSH '12
[ Athletic Training ]
CEU
Prevention of Elbow Injuries in Youth Baseball Pitchers
Glenn S. Fleisig, PhD,* and James R. Andrews, MD
Context: Although baseball is a relatively safe sport, numerous reports suggest a rapid rise in elbow injury rate among youth baseball pitchers.
Figure 1. Maximum elbow varus torque.
Sports Biomech '18
SPORTS BIOMECHANICS, 2018
VOL. 17, NO. 3, 314–321
https://doi.org/10.1080/14763141.2017.1340508
Routledge
Taylor & Francis Group
Do baseball pitchers improve mechanics after biomechanical evaluations?
Glenn S. Fleisig, Alek Z. Diffendaffer, Brett Ivey and Kyle T. Aune
American Sports Medicine Institute, Birmingham, AL, USA
ABSTRACT
The purpose of this study was to determine how often flaws in pitching mechanics identified from biomechanical analysis are corrected. The biomechanics of 46 baseball pitchers were evaluated twice, with an average of 12 months (range 2–48 months) between evaluations. Pitchers were healthy at the time of both evaluations, competing at the high school, college, minor league or Major League level.
ARTICLE HISTORY
Received 13 December 2016
Accepted 6 June 2017
KEYWORDS
Kinematics; training; amateur; professional


Sports Health | SAGE
Sports Health. 2017 May-Jun; 9(3): 216–221.
Published online 2017 Jan 1. doi: 10.1177/1941738116686545
PMCID: PMC5435152
PMID: 28107113
The Relationship Between Pitching Mechanics and Injury: A Review of Current Concepts
Peter N. Chalmers, MD,* Markus A. Wimmer, PhD, Nikhil N. Verma, MD, Brian J. Cole, MD, MBA, Anthony A. Romeo, MD, Gregory L. Cvetanovich, MD, Michael L. Pearl, MD, Peter N. Chalmers, MD, Markus A. Wimmer, PhD, Nikhil N. Verma, MD, Brian J. Cole, MD, MBA, Anthony A. Romeo, MD, Gregory L. Cvetanovich, MD, and Michael L. Pearl, MD
*Peter N. Chalmers, MD, Department of Orthopaedic Surgery, Rush University Medical Center, 1611 West Harrison Street, Chicago, IL 60612 (email: p.n.chalmers@gmail.com).
Author information ▼ Copyright and License information ► Disclaimer
✓ Altered knee flexion, early trunk rotation
✓ Loss of Shoulder ROM, increased elb flex @BR
✓ High pitch velocity & pitcher fatigue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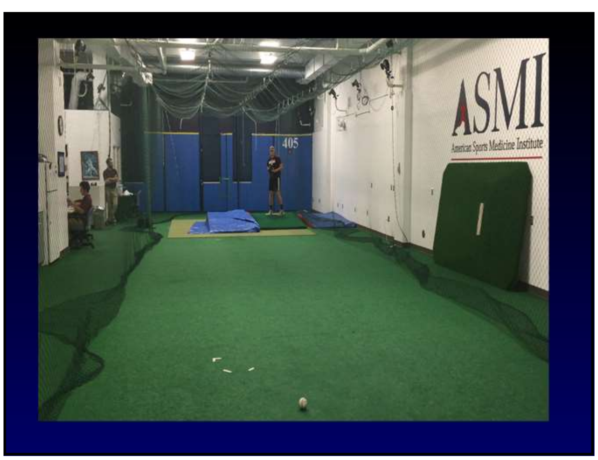
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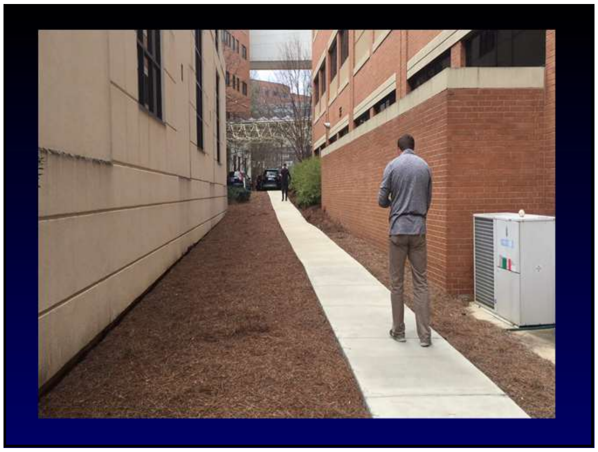



## Rehab Overhead Athlete

*Return to Play Criteria – **ITP I***

- ✓ Full sport specific non painful ROM
- ✓ Satisfactory Clinical Exam
- ✓ Strength which meets the criteria
- ✓ Appropriate rehab progression completed
- ✓ Functional Testing - satisfactory
- ✓ Successfully has completed rehab program
- ✓ Satisfactory subjective KJOC functional scoring

***An Objective Criteria is Important***

## *Criteria Return to Throwing*

*Shoulder Motion PROM*

- Full Non-Painful ROM
- Shoulder TROM within 5° bilateral
- Horizontal adduction 40° $\geq$
- GIRD < 15°
- Elbow full non-painful ROM
- Wrist full non-painful ROM

*Wilk et al: CORR '12*
*Wilk et al: AJSM '15*

## Criteria to Return to Throwing
### Clinical Exam

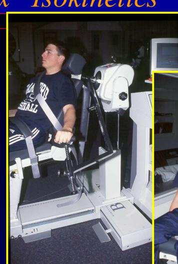
- ✓ Physician Clinical Exam
- ✓ Satisfactory exam
- ✓ Special tests
- ✓ Shoulder Joint
  - ✓ SLAP tests
  - ✓ Rotator Cuff tests
  - ✓ Laxity exam
- ✓ Elbow Joint
  - ✓ UCL testing
  - ✓ Ulnar nerve testing
  - ✓ …

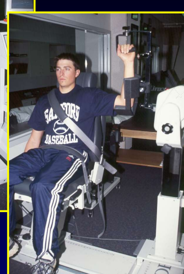
*Valgus Stress Testing - Prone*

## Return to Throwing Criteria
### *Biodex -Isokinetics*

- *ER / IR ratios*
  - ✓ *72 - 76%*
- *ER / ABD ratios*
  - ✓ *68 - 73%*
- *Torque / BW ratios*
  - ✓ *ER 18 - 23%*
  - ✓ *IR 26 - 32%*
- *Bilateral comparison*
  - ✓ *ER 95-100%; IR 115%*

*Wilk et al: AJSM '93*
*Wilk et al: AJSM '95*





## Criteria to Return to Throwing
### *Appropriate Rehab Progression*

- ✓ Plyometrics
  - ✓ painfree 2 hand throwing
  - ✓ painfree 1 hand throwing
- ✓ Dynamic stabilization drills
  - ✓ RS drills at 90/90)
  - ✓ prone ball drops

## Return to Throw Criteria
*Ball Drop Test*

- Dynamic stabilization tests
  - Prone ball drops
    - 30 sec test
    - prone on plinth
    - number of releases/catches
    - 3 trials – mean of 3 trials
    - compare Dom to Non Dom
    - score: %
    - Goal: 90%>
    - Expectation: 110%>

## Return to Throw Criteria
*Functional Testing*

- *Three years of Testing: (5/18)*
  - Healthy Professional: 171
  - Healthy College: 62
  - Healthy High School: 91
  - Healthy Totals: 324

  - Patients: UCLr & Brace: 87

## Return to Throw Criteria
*Ball Drop Test (T Side)*

## Return to Throw Criteria

*Ball Drop Test (NT Side)*

## Return to Throw Criteria

*Ball Drop Test - Error*

## Return to Throw Criteria

*One Hand Ball Throws Against Wall*

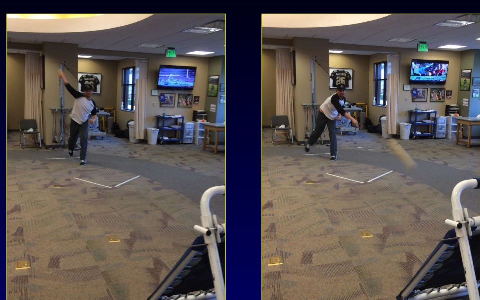
- Ball Wall Throws
  - Baseball Style Throws
    - 2 lb plyoball
    - baseball style throws
    - 30 sec duration
    - bilateral comparison
    - Successful Criteria:
    - no pain
    - proper mechanics
    - no change with fatigue
    - bilateral difference: depends level

## Return to Throw Criteria

*One Hand Ball Throws Against Wall*

## *Criteria to Return to Throwing*

*Functional Testing*



## Return to Throw Criteria Phase

*One Hand Ball Throws Against Plyoback 66%*

## Return to Play Criteria
*Single Leg Squat*

- ✓ Single leg squat test
  - ✓ Floor or 8 in step
    - ✓ 30 sec test on each leg
    - ✓ assess technique & numbers
    - ✓ assess valgus/varus
    - ✓ assess lateral trunk movt.
    - ✓ assess trunk flexion
    - ✓ looking for symmetrical motion with no pain &/or dysfunction
    - ✓ *ability to maintain balance & form for all reps*

## Return to Play Criteria
*Prone Plank on Elbows Test*

- ✓ Prone Plank test
  - ✓ Test Procedure:
    - ✓ prone on elbows
    - ✓ maintain position
    - ✓ duration of proper hold

***Strand et al: J Hum Kinet '14***
- ✓ **Men 124 sec + 72**
- ✓ **Woman 83 sec + 63**

| Rating | Male | Female |
|---|---|---|
| World record | 33 mins | 33 mins |
| Exceptional | 6:30 + | 6 mins+ |
| Very strong | 240-390 | 240-360 |
| Strong | 120-240 | 120-240 |
| Healthy | 60-120 | 60-120 |
| Acceptable | 30-60 | 30-60 |
| Weak | 11-29 | 11-29 |
| Very Weak | 1-10 | 1-10 |
| Alarmingly weak | can't hold position | |

Journal of Human Kinetics volume 40/2014, 93-102 DOI: 10.2478/hukin-2014-0011 93
Section II- Exercise Physiology & Sports Medicine

**Norms for an Isometric Muscle Endurance Test**

by
Sarah L. Strand[1], John Hjelm[2], Todd C. Shoepe[3], Marie A. Fajardo[3]

*Musculoskeletal performance assessment is critical in the analysis of physical training programs in order to prioritize goals for decreasing injury risk and focusing performance goals. Abdominal endurance as part of this analysis is often assessed with techniques that have validity that has been debated in literature. The purpose of this study was to develop normative sex- and athlete-specific percentiles for a trunk stabilization and muscular endurance by using a prone forearm plank test in college-aged students. A second purpose of this study was to investigate the effect of habitual physical activity and the reason for test termination. There were 471 participants (means ± SE: males: n = 194, age 20.4 ± 0.2 years, body height 179.4 ± 0.5 cm, body mass 81.1 ± 1.2 kg; females: n = 277, age 20.2 ± 0.2 years,*

Table 2
*Percentiles scores by sex and percentile scores by sport status*

| | Time to Fatigue in the Plank-Test (all values in seconds) | | | |
|---|---|---|---|---|
| Percentile | Male (n = 194) | Female (n = 277) | Non-Varsity (n = 109) | Varsity (n = 361) |
| 10th | 62 | 35 | 37 | 59 |
| 20th | 79 | 48 | 53 | 66 |
| 30th | 89 | 58 | 62 | 82 |
| 40th | 97 | 63 | 71 | 92 |
| 50th | 110 | 72 | 83 | 104 |
| 60th | 122 | 84 | 94 | 123 |
| 70th | 137 | 95 | 106 | 149 |
| 80th | 157 | 108 | 123 | 178 |
| 90th | [illegible] | 142 | [illegible] | 200 |

## Return to Throw Criteria

*Appropriate Rehab Progression*

- ✓ Subjective Shoulder Questionnaire & Scoring System



**The Development and Validation of a Functional Assessment Tool for the Upper Extremity in the Overhead Athlete**

*AJSM '11*

Frank G. Alberta, MD, Neal S. ElAttrache, MD, Scott Bissell, MD, Karen Mohr, PT, Jason Browdy, MD, Lewis Yocum, MD, and Frank Jobe, MD

*From Kerlan-Jobe Orthopaedic Clinic, Los Angeles, California, Hackensack University Medical ... Partners, Orthopedics and Rehabilitation ... anced Orthopaedics of Clayton,*

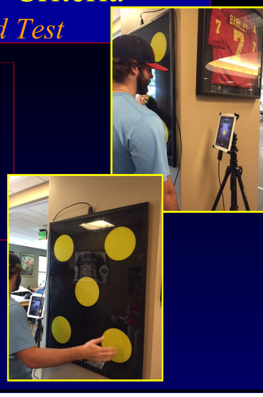
## Rehab Overhead Athlete

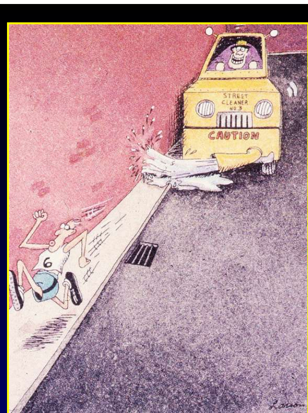
*Return to Play Criteria – **ITP II***

- ✓ Full non painful ROM which fulfills criteria
- ✓ Satisfactory Clinical Exam
- ✓ Strength which meets the criteria
- ✓ Appropriate rehab progression completed
  - ★✓ *Completed ITP Phase I, & flat ground at 75% effort*
- ✓ Functional Testing – satisfactory
  - ★✓ *20 feet throwing in to plyoback w/ 1 lb at 66%*
  - ✓ *prone ball drop test – 2 lb: 115%≥*
  - ✓ *ball wall throws for 30 sec*
- ✓ Satisfactory subjective KJOC functional scoring

## Return to Play Criteria
*Quick Board Test*

- ✓ Reaction test
  - ✓ Quick Board Test:
    - ✓ 30 sec test
    - ✓ side to side comparison
    - ✓ number of touches/misses

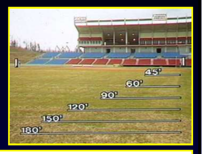





## Throwing Programs

## Interval Throwing Program
### *ITP - Long Toss Program*

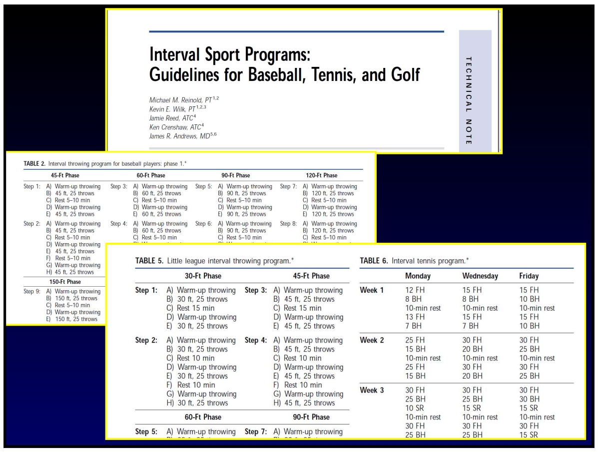
- Interval Throwing Program ITP
- Throw every other day (M,W,F)
- Gradual progression 45ft – 120/150
- Multiple step progression
- Each step performed 2 days
- Overlapping distances
- Crow hop throwing
- Arch on the ball
- Submax throwing initially





Phase I for pitchers

*Is Throwing Longer Better ??*


Interval Sport Programs: Guidelines for Baseball, Tennis, and Golf

Michael M. Reinold, PT[1,2]
Kevin E. Wilk, PT[1,2,3]
Jamie Reed, ATC[4]
Ken Crenshaw, ATC[4]
James R. Andrews, MD[5,6]

TECHNICAL NOTE

TABLE 2. Interval throwing program for baseball players: phase 1.*

| 45-Ft Phase | 60-Ft Phase | 90-Ft Phase | 120-Ft Phase |
|---|---|---|---|
| Step 1: A) Warm-up throwing B) 45 ft, 25 throws C) Rest 5–10 min D) Warm-up throwing E) 45 ft, 25 throws | Step 3: A) Warm-up throwing B) 60 ft, 25 throws C) Rest 5–10 min D) Warm-up throwing E) 60 ft, 25 throws | Step 5: A) Warm-up throwing B) 90 ft, 25 throws C) Rest 5–10 min D) Warm-up throwing E) 90 ft, 25 throws | Step 7: A) Warm-up throwing B) 120 ft, 25 throws C) Rest 5–10 min D) Warm-up throwing E) 120 ft, 25 throws |
| Step 2: A) Warm-up throwing B) 45 ft, 25 throws C) Rest 5–10 min D) Warm-up throwing E) 45 ft, 25 throws F) Rest 5–10 min G) Warm-up throwing H) 45 ft, 25 throws | Step 4: A) Warm-up throwing B) 60 ft, 25 throws C) Rest 5–10 min | Step 6: A) Warm-up throwing B) 90 ft, 25 throws C) Rest 5–10 min | Step 8: A) Warm-up throwing B) 120 ft, 25 throws C) Rest 5–10 min |
| **150-Ft Phase** | | | |
| Step 9: A) Warm-up throwing B) 150 ft, 25 throws C) Rest 5–10 min D) Warm-up throwing E) 150 ft, 25 throws | | | |

TABLE 5. Little league interval throwing program.*

| 30-Ft Phase | 45-Ft Phase |
|---|---|
| Step 1: A) Warm-up throwing B) 30 ft, 25 throws C) Rest 15 min D) Warm-up throwing E) 30 ft, 25 throws | Step 3: A) Warm-up throwing B) 45 ft, 25 throws C) Rest 15 min D) Warm-up throwing E) 45 ft, 25 throws |
| Step 2: A) Warm-up throwing B) 30 ft, 25 throws C) Rest 10 min D) Warm-up throwing E) 30 ft, 25 throws F) Rest 10 min G) Warm-up throwing H) 30 ft, 25 throws | Step 4: A) Warm-up throwing B) 45 ft, 25 throws C) Rest 10 min D) Warm-up throwing E) 45 ft, 25 throws F) Rest 10 min G) Warm-up throwing H) 45 ft, 25 throws |
| **60-Ft Phase** | **90-Ft Phase** |
| Step 5: A) Warm-up throwing | Step 7: A) Warm-up throwing |

TABLE 6. Interval tennis program.*

| | Monday | Wednesday | Friday |
|---|---|---|---|
| Week 1 | 12 FH<br>8 BH<br>10-min rest<br>13 FH<br>7 BH | 15 FH<br>8 BH<br>10-min rest<br>15 FH<br>7 BH | 15 FH<br>10 BH<br>10-min rest<br>15 FH<br>10 BH |
| Week 2 | 25 FH<br>15 BH<br>10-min rest<br>25 FH<br>15 BH | 30 FH<br>20 BH<br>10-min rest<br>30 FH<br>20 BH | 30 FH<br>25 BH<br>10-min rest<br>30 FH<br>25 BH |
| Week 3 | 30 FH<br>25 BH<br>10 SR<br>10-min rest<br>30 FH<br>25 BH | 30 FH<br>25 BH<br>15 SR<br>10-min rest<br>30 FH<br>25 BH | 30 FH<br>30 BH<br>15 SR<br>10-min rest<br>30 FH<br>15 SR |

## Interval Throwing Program
### *Long Toss Program*

- Suggested application
  - » Gradually increase distance
  - » 120 –150 feet ???
- Advantages
  - » Arm strengthening
  - » Flexibility (get loose)
- Disadvantages:
  - » Ball release point
  - » Differences in mechanics

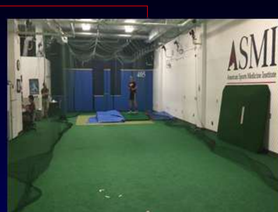

*Is Throwing Longer Better ??*


*Fleisig, Bolt, Fortenbaugh, Wilk: JOSPT '11*

- 17 healthy college pitchers
- Biomechanical analysis of long & short throwing
- Threw 18.4m , 37m, 55m & maximal distance on a line
- Shoulder line was horizontal for mound distance but gradually went uphill as distance increased
- ✓ *Maximal throwing distance resulted in more ER, more Elb Flexion, more shoulder IR torque & more varus elbow torque*
- Trunk tilt gradually increased with distance

## Interval Throwing Program
*Mound Throwing*

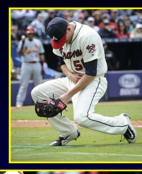
- Rate of progression
  50% - 75% - 100%
- *What does that mean ?*
  - ✓ *50% is really 75%*
  - ✓ *75% is really 90%*
  - *Fleisig et al : ASMI '98*

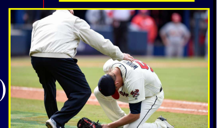



- Fastballs ⟶ Breaking balls

## Overhead Athlete - Throwing Programs
*How to Prevent Re-Injuries*

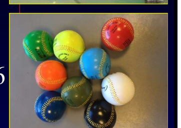
- ✓ Proper Mechanics
- ✓ Steady progression in throwing programs
- ✓ Proper conditioning
- ✓ Watch distance – (mechanics)
- ✓ Weighted ball throwing
- ✓ Velocity (too much hard throws)
- ✓ Proper rest – periodization
- ✓ Avoid specialization – early career

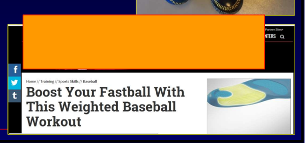


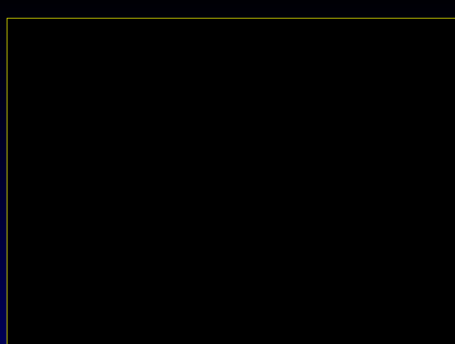


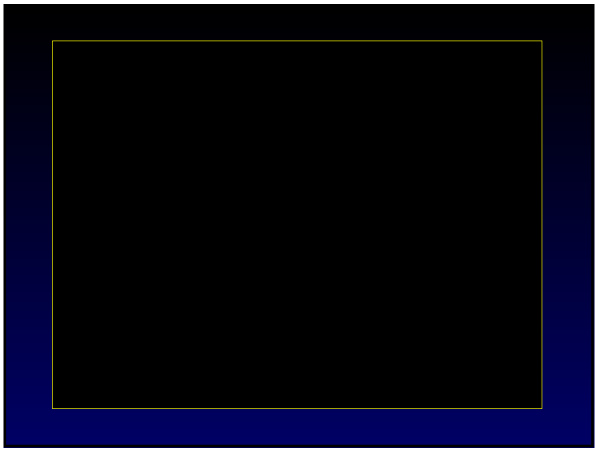
## Rehab Overhead Throwing Athlete
*Weighted Ball Programs*

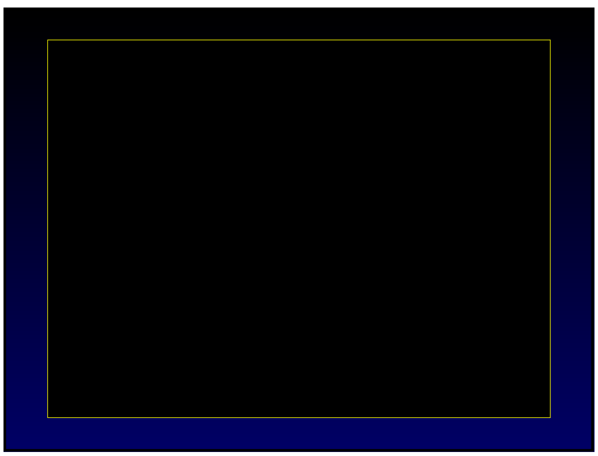
- Popular form of training
- Proposed to increase throwing velo
- Program utilizes weighted baseballs
- 4-8 week program prior season
- Been using plyoball throws since '86
  *Wilk, Gambetta, et al: JOSPT '93*
- Literature review:
  *DeRenne: Athlet J '85*
  *DeRenne: J Appl Spt Sci R '90*
  *Escamilla et al: Spts Health '00*
  *Fleisig et al: JSH '16*









## Rehab Overhead Throwing Athlete
*Weighted Ball Programs*

Table I. Effects of training with overweight and underweight baseballs on throwing velocity and accuracy.

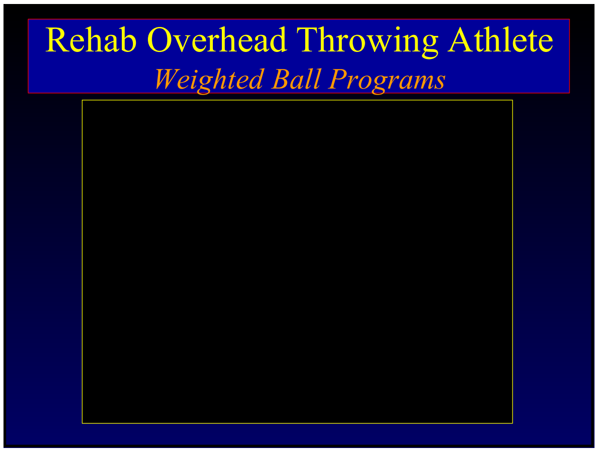
| Reference | Number of participants | Age level | Duration (w) | Number of throws per week | Baseball weights (oz) | Significant increase in throwing velocity? | Significant change in accuracy? |
|---|---|---|---|---|---|---|---|
| **Overweight training** | | | | | | | |
| Brose & Hanson[9] | 7 | College | 6 | 75 | 10, 160ª | Yes | No |
| Litwhiler & Hamm[10] | 5 | College | 12 | 165 | 7-12 | Yes (5 m/s) | No |
| Logan et al.[11] | 13 | College | 6 | 150 | 40ª | Yes (6.5-11.6%) | NM |
| Straub[12] | 24 | High school | 6 | 60 | 7-17 | No | No |
| DeRenne et al.[13,14] | 5 | High school | 10 | NS | 5-6 | Yes (6.67 m/s) | NM |
| DeRenne et al.[14,15] | 10 | High school | 10 | 150 | 5-6 | Yes (5.3%) | NM |
| **Underweight training** | | | | | | | |
| DeRenne et al.[13,14] | 5 | High school | 10 | NS | 4-5 | Yes (1.34 m/s) | NM |
| DeRenne et al.[14,15] | 10 | High school | 10 | 150 | 4-5 | Yes (6.7%) | NM |
| DeRenne et al.[14] | 17 | High school | 10 | 187 | 4 | Yes (3.2%) | NM |
| **Overweight and underweight integral training** | | | | | | | |
| DeRenne et al.[14,16] | 150 | High school and college | 10 | 198 | 4-6 | Yes (4-6%) | NM |

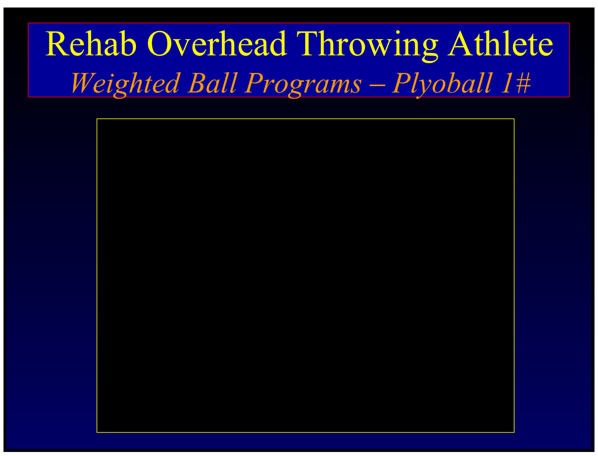
a Amount of resistance while throwing a baseball attached to a wall pulley.
**NM** = accuracy not measured in study; **NS** = number of throws not specified in study.

Effects of Throwing Overweight and Underweight Baseballs on Throwing Velocity and Accuracy

## Rehab Overhead Throwing Athlete
*Weighted Ball Programs*

## Rehab Overhead Throwing Athlete
*Weighted Ball Programs*


Rehab Overhead Throwing Athlete
*Weighted Ball Programs*


Rehab Overhead Throwing Athlete
*Weighted Ball Programs – Plyoball 1#*

## *Fleisig et al: JSH '16*

- 25 high school & college baseball pitchers
- 3 trials of 10 different exercises:
  - » 4,5,6 & 7 oz ball from mound
  - » Flat ground holds with 14 & 32 oz baseballs
- Biomechanical analysis during throws
- ✓ *Ball velocity with lesser ball mass*
- ✓ *Overweight throwing - arm torques & forces decreased*
- ✓ *Underweight throwing – kinematics & kinetics same*
- ✓ *Exception was elbow flexion torque which significantly increased with increase ball*
- ✓ *Body positions differences occurred with ball size*


## *Reinold: JSH '18*

- 34 male high school baseball players (age 15)
- 16 study, 16 control
- Measured strength HHD, ROM, FB velo, elbow stress (motus)
- 6 week training program (2-32 oz balls)
- ✓ Study group 4% (2.6mph) increase in velo, no diff strength, valgus stress
- ✓ ROM 5° increase in ER, TROM (no diff)
- ✓ 4 inj in study grp (25%) (2 UCL, 1 Olecranon stress fx) 0 injuries control group

## Blood Flow Restriction (BFR) Training & Rehab

- Causes venous blood to pool distal to the occlusion
  - » *Creates Hypoxic environment*
  - » *Metabolites accumulate*
  - » *Release of growth factors, hormones & stem cells*
- *Utilizes 20-30% 1RM and provides similar gains in muscle hypertrophy & strength*
  - » Compared with standard ACSM guidelines
    - 70-85% 1RM

## What is Blood Flow Restriction (BFR) Training-How Does it Work?

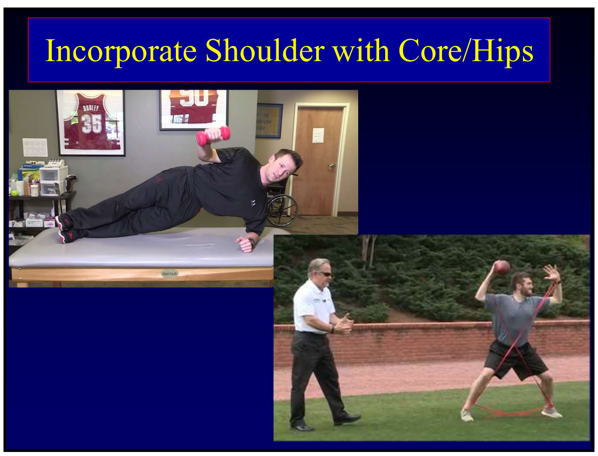
- Actual mechanism remains unclear
  - » Localized hypoxic stimulus may play important role in BFR training with low load resistance
  - » Hypoxic stimulus may cause greater accumulation of metabolites that increase muscle cell swelling, intramuscular anabolic /anti-catabolic signaling, and muscle fiber recruitment (Type-II)
    - All thought to be beneficial for muscular adaptation
  - » Hypoxic environment may increase the activation and proliferation of myogenic stem cells leading to enhancing hypertrophic response

**Scott et al, 2015**

## Sample: UE Rehab Routine with BFR

- Heat/PROM/Stretching/Dynamic Warm up
- Manually Resisted ER/IR
- BFR Application:
  - » Tubing IR/ER bilaterally (3x15)
  - » Full Can (3x15)
  - » Sidelying ER (3x15)
  - » TRX Program
- BFR Removed
- Total Time of Bands – 15-20 min

## *New Rehabilitation Concepts*


Incorporate Shoulder with Core/Hips

Hips/Core into Shoulder Training


Hips/Core into Shoulder Training

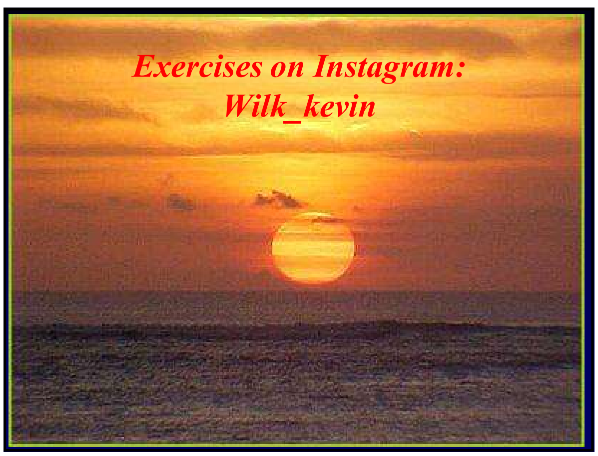

Side Plank ER Strengthening

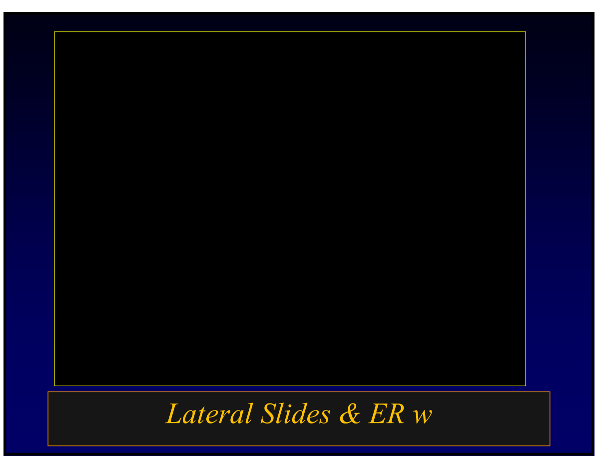
## Hips/Core into Shoulder Training

## Endurance - Side Plank ER Strengthening

## Side Plank ER with Core Control


Reverse Wall Slides


Exercises on Instagram:
Wilk_kevin


Lateral Slides & ER w

Prone ER Plyoball Flips

## Organizations Using Blood Flow Restriction

- Anaheim Angels
- Arizona Cardinals
- Baltimore Ravens
- Buffalo Bills
- Calgary Flames
- Carolina Panthers
- Chicago Bears
- Cincinnati Reds
- Cleveland Browns
- Cleveland Indians
- Denver Broncos
- Detroit Lions
- Detroit Redwings
- Houston Astros
- Houston Rockets
- Houston Texans
- Jacksonville Jaguars
- Los Angeles Dodgers
- Los Angeles Rams
- Memphis Grizzlies
- Miami Dolphins
- New England Patriots
- New Orleans Saints
- New York Giants
- New York Yankees
- Oklahoma City Thunder
- Pittsburgh Steelers
- Portland Trail Blazers
- San Antonio Spurs
- San Diego Chargers
- San Diego Padres
- St. Louis Cardinals
- Tampa Bay Buccaneers
- Tennessee Titans
- Toronto Blue Jays
- Utah Jazz
- Vancouver Canucks
- Vancouver Whitecaps
- University of Florida
- University of Nebraska
- University of Missouri
- University of Memphis
- University of Southern California
- Ohio State University
- University of Michigan
- University of California Los Angeles
- University of Alabama
- Tulane University
- Loyola Marymount University
- University of Miami
- Arkansas State University
- Florida State University
- University of Jacksonville
- Eastern Kentucky University
- Western Kentucky University
- University of Louisville
- University of Arkansas
- University of Georgia
- Marshall University
- Rutgers University
- North Carolina State
- University of North Carolina
- Mississippi State University
- University of Mississippi
- University of Texas

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## 2015 Systematic Review and Meta-Analysis

- Cuff size considerations:
  - » Wider cuff results in more occlusion
  - » Narrow cuffs results in increased pressure to reach same level of occlusion
  - » Increased limb size results in increased pressure to occlude
- Pressures:
  - » Leonneke compared 40% to 90% and saw no difference
  - » Make sure they can get prescribed sets and reps

**Slysz et al, 2015**


## Rehab Overhead Thrower
*Conclusions & Key Points*

- ✓ *Criteria to initiate ISP reduces re-injury rates by 84 % (21/54 pts who didn't pass – reinjury*
  *Grindem et al: BJSM'16*
- ✓ Criteria Based vs Time Based Progression
  - ✓ Patients progress at different rates
  - ✓ Incentivies the patient to be comply & work
- ✓ *New concepts in rehab*
- ✓ *Rehab continues to evolve & improve*
- ✓ *New is not always better – Evidence Based Rx*


Thank You !!!!


Thank You