

No Association of Time From Surgery With Functional Deficits in Athletes After Anterior Cruciate Ligament Reconstruction

AJSM '12

Evidence for Objective Return-to-Sport Criteria

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 Investigation performed at Cincinnati Children's Hospital Medical Center

Y Balance Test

Reduce Re-Injury Rate by 84% **Strict Criteria to Return to Sports**

Original article

Simple decision rules can reduce reinjury risk by 84% after ACL reconstruction: the Delaware-Oslo ACL cohort study

Hege Grindem,¹ Lynn Snyder-Mackler,² Håvard Moknes,³ Lars Engebretsen,^{3,4} May Arna Risberg^{1,4}

ABSTRACT
Background: Knee injury after ACL reconstruction is common and increases the risk of osteoarthritis. There is sparse evidence to guide return to sport (RTS) decisions in this population.
Objectives: To assess the relationship between knee injury after ACL reconstruction and (1) return to level I sport, (2) timing of RTS and (3) knee function prior to return to sport.
Methods: 106 patients who participated in planting sports participated in this prospective 2-year cohort study. Sports participation and knee injury were recorded monthly. Knee function was assessed with the Knee Outcome Survey—Activities of Daily Living Scale, global rating scale of function, and quadriceps strength.
Results: 106 patients who participated in planting sports participated in this prospective 2-year cohort study. Sports participation and knee injury were recorded monthly. Knee function was assessed with the Knee Outcome Survey—Activities of Daily Living Scale, global rating scale of function, and quadriceps strength.
Conclusion: Injury could lead to \$1.1 billion in cost savings annually.
 Injured athletes who do not return to level I (jumping, pivoting and hard cutting) sports^{1,2,3} is the main reason why a patient with an ACL requires undergone ACL reconstruction. Younger age and participation in pivoting sports are also independently consistent predictors of another ACL rupture after ACL reconstruction.^{4,5,6} Activity restrictions based on post-surgical time to return to sport for biological healing and functional status (assessed with the hamstring) have been advocated to enable the safest possible return to sport (RTS).^{7,8} There is currently no clear evidence to guide whether participation in level I sports should be delayed or what level of function

Functional Movement Screen FMS

Grindem, Snyder-Mackler, Engebretsen: BJSM '16

- Can we reduce re-injury rates in ACLR pts
- Delaware-Oslo ACL Cohort Study
- 106 patients ACLR – 2yr FU
- ✓ 30% pts returning Level I sustained re-injury, 8% returning to a lower level (4x higher reinj rate)
- ✓ Every month delayed returned to sports until 9mos – rate of re-injury was reduced 51%
- ✓ Fulfill strict objective criteria to RTP
- ✓ More symmetrical quadriceps strength prior to return to sports sign. Reduced re-injury rate



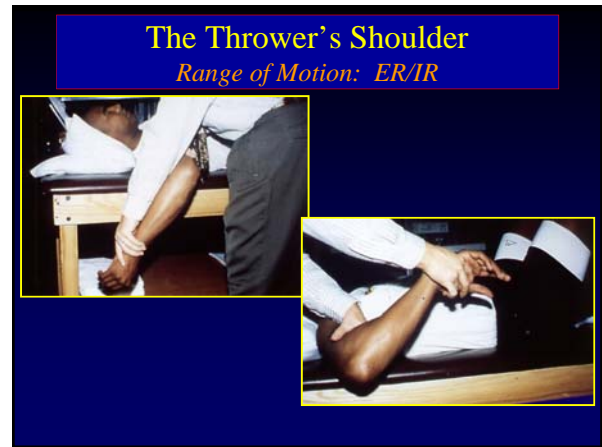
Rehab Overhead Athlete Return to Play Criteria

**Return to Throwing
Criteria to Initiate Phase I Throwing (Long Toss)**

- Full Test Passed (8/10)
 - Healthy Throat (color, 17 of 18) (no sore throat)
 - Healthy Cervical vertebrae (8/9) (no sore throat)
 - CRS of 17
 - HR 140 or less (HR 140-150)
- Medication-free (no NSAIDs, steroids, or painkillers)
 - HR 140 or less (HR 140-150)
 - Throat healthy (17 of 18) (no sore throat)
 - Throat healthy (8/9) (no sore throat)
 - HR 140 or less (HR 140-150) (no sore throat)
 - HR 140 or less (HR 140-150) (no sore throat)
- Successful rehab program
 - Completed all rehab program
 - HR 140 or less (HR 140-150) (no sore throat)
 - Throat healthy (17 of 18) (no sore throat)
 - Throat healthy (8/9) (no sore throat)
 - HR 140 or less (HR 140-150) (no sore throat)
 - HR 140 or less (HR 140-150) (no sore throat)
- Functional scoring
 - Phase I Long Toss (17 of 18) (no sore throat)
 - Phase II Long Toss (17 of 18) (no sore throat)
 - HR 140 or less (HR 140-150) (no sore throat)
 - HR 140 or less (HR 140-150) (no sore throat)

**Return to Throwing
Criteria to Initiate Phase II Throwing (Overhead Throwing)**

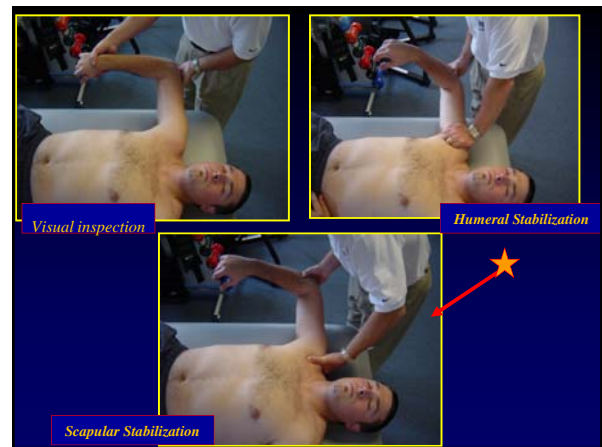
- Full Test Passed (8/10)
 - Healthy Throat (color, 17 of 18) (no sore throat)
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 - HR 140 or less (HR 140-150) (no sore throat)



Rehab Overhead Athlete Return to Play Criteria

- ✓ Full sport specific non painful ROM
- ✓ Strength which meets the criteria
- ✓ Excellent stability and no painful special tests
- ✓ Demonstrates proper throwing mechanics
- ✓ Successfully has completed rehab program
- ✓ Appropriate rehab progression completed
- ✓ Satisfactory functional scoring

An Objective Criteria is Important – ITP I & II



Wilk - Return to Play Criteria in the
 Thrower 2017
 SPTS Team Concept Meeting Las Vegas

[Sports Physical Therapy] J Sports Health '09

Glenohumeral Internal Rotation Measurements Differ Depending on Stabilization Techniques

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 Leonard C. Macrina, MSPT, SCS,* Ron Porterfield, MS, ATC,* and James R. Andrews, MD*

Background: The loss of glenohumeral internal rotation range of motion in overhead athletes has been well documented in the literature. Several different methods of assessing this measurement have been described, making comparisons between the results of studies difficult.

Hypothesis: Significant differences in the amount of internal rotation range of motion exist when using different methods of stabilization.

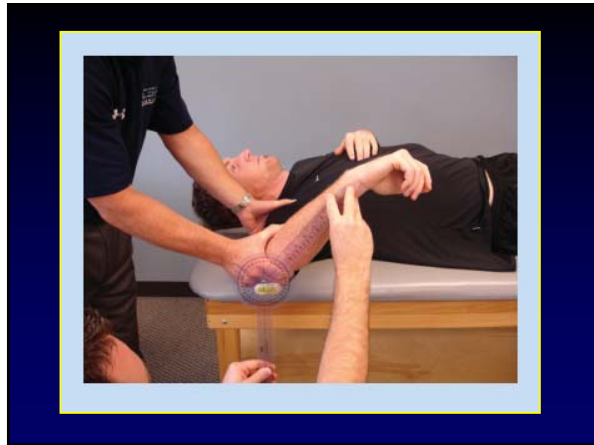
Study Design: Descriptive laboratory study.

Figure 1. Glenohumeral internal rotation positive range of

The Thrower's Shoulder

Range of Motion

Adaptations



Total Rotational Motion Concept

$ER + IR = Total Motion$

“Envelope of Motion”

Wilk AJSM '02

Total Rotational Motion is equal bilaterally (within 5 degrees)

Throwing Shoulder

Non-Throwing Shoulder



Wilk, Macrina, Porterfield et al: 2015

Pitchers Shoulder ROM ('05-'15)

	D	ND
• ER at 90° abduction:	131.1	125.1
• IR at 90° abduction:	53.3	63.2
• Total Rotational ROM:	184.3	187.4
• Horizontal adduction:	42.9	45.2
• ER Horz Adduction:	32.5	28.1

N= 1226

Wilk - Return to Play Criteria in the
 Thrower 2017
 SPTS Team Concept Meeting Las Vegas

Clinical Orthopaedics and Related Research
 DOI 10.1007/s11999-012-2265-z
 SYMPOSIUM: INJURIES IN OVERHEAD ATHLETES

CORR '12

Passive Range of Motion Characteristics in the Overhead Baseball Pitcher and Their Implications for Rehabilitation

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ROM characteristic	Dominant	Nondominant	Significance
External rotation at 45°	102 ± 12	98 ± 12	< 0.001
External rotation at 90°	132 ± 11	127 ± 11	< 0.001
Internal rotation at 90°	52 ± 12	63 ± 12	< 0.001
Total rotational motion	184	190	< 0.001
Horizontal adduction	42 ± 8	44 ± 8	0.001

* Mean in degrees. **N=369**

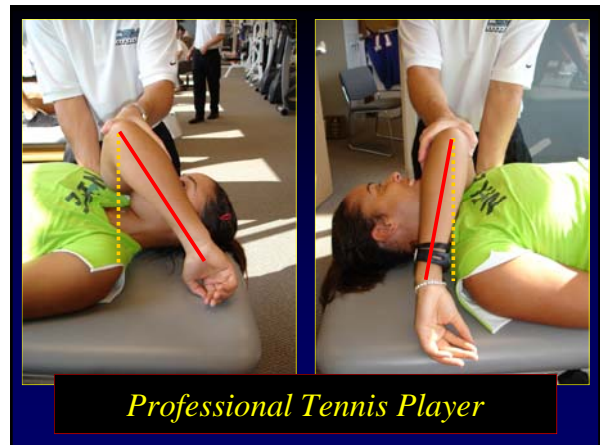
(r = 0.12; p < 0.001) with throwing side horizontal adduction.



Thrower's Shoulder ROM
PROM Assessment

Shoulder Flexion

Shoulder Horz Abd

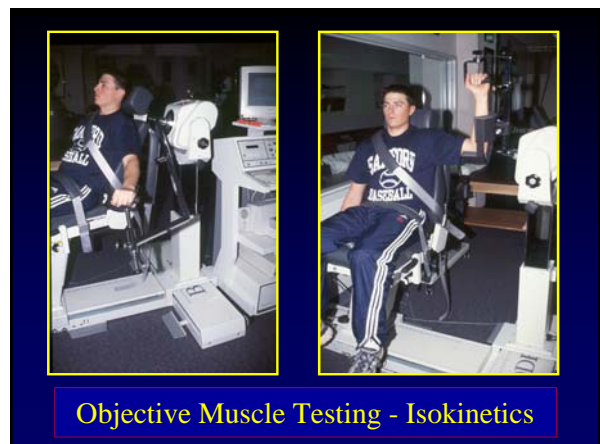
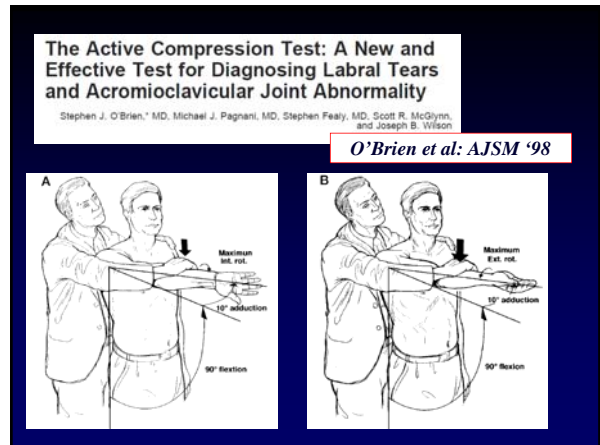
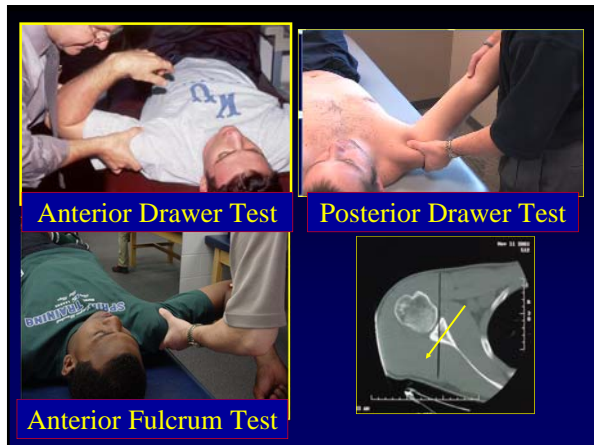


Criteria to RTP Thrower's
Range of Motion Goals

- ✓ TROM within 5°
- ✓ Horizontal adduction 40°>
- ✓ GIRD < 20°
- ✓ Elbow full ROM
- ✓ Wrist full ROM
- ✓ Non-painful ROM


Criteria to RTP Thrower's
Clinical Exam

- ✓ Satisfactory Clin Exam



Criteria to RTP Thrower's Muscle Strength Goals

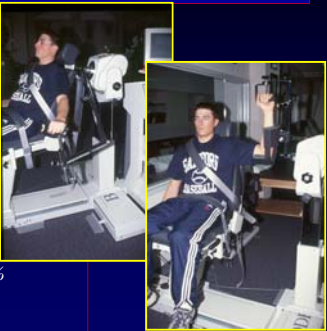
- ✓ ER/IR Ratio: 72-76%
- ✓ ER/ABD Ratio: 68-72%
- ✓ ER: 95%>
- ✓ IR: 115%>
- ✓ Elbow Flexion: 110-115%
- ✓ Elbow extension: 115-120%




Assess Muscular Strength Biodex –Isokinetics Throwers

- 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



Scapular Strength Ratios

Wilk, Reinold, Hooks... Unpublished data '07


	Pitchers		Non-throwers	
	D	ND	D	ND
Elev / Depress	400%	480%	520%	540%
Retract / Protract	88%	71%	78%	71%

“Objective MMT”



Criteria to RTP Thrower's Functional Assessments: Goals

- ✓ Appropriate rehab progression
 - ✓ completed plyo program
 - ✓ no symptoms
- ✓ Functional Tests:
 - ✓ prone ball drops: 110%>
 - ✓ wall throws: 110>
 - ✓ #1 plyoball throws from 20 ft.
 - ✓ step down test: satisfactory



Return to Play Criteria

Appropriate Rehab Progression

- ✓ Plyometric Drills
 - ✓ 2 hand throws
 - ✓ 1 hand throws
- ✓ Dynamic Stabilization Drills
 - ✓ RS drills at 90/90 (P/F)
 - ✓ prone ball drops






Return to Play Criteria

Ball Throws into Wall Test




- ✓ Dynamic stabilization tests
 - ✓ Ball Throws into Wall
 - ✓ 30 sec test
 - ✓ standing in doorway
 - ✓ number of releases/catches
 - ✓ compare Dom to Non Dom
 - ✓ score: %
 - ✓ Goal: 100%>
 - ✓ Expectation: 115%>



Return to Play Criteria

Appropriate Rehab Progression


- ✓ Dynamic stabilization drills
 - ✓ RS drills at 90/90 (P/F)
 - ✓ prone ball drops

Return to Play Criteria

Appropriate Rehab Progression



- ✓ Plyometrics
 - ✓ painfree 1 hand throwing

Return to Play Criteria

Ball Drop Test


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

Return to Play Criteria

Single Leg Squat

- ✓ Single leg squat test
 - ✓ Floor or 8 in step
 - ✓ 10 reps on each leg
 - ✓ assess depth
 - ✓ assess valgus/varus
 - ✓ assess lateral trunk movt.
 - ✓ assess trunk flexion
 - ✓ looking for symmetrical motion with no pain &/or dysfunction



Return to Play Criteria

Appropriate Rehab Progression

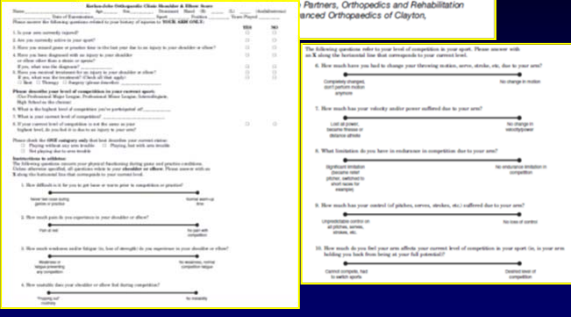
- ✓ **Plyometrics**
 - ✓ painfree 1 hand throwing
 - ✓ completed a successful program
- ✓ **Dynamic stabilization drills**
 - ✓ RS drills at 90/90 (P/F)
 - ✓ prone ball drops



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

AJSM '11


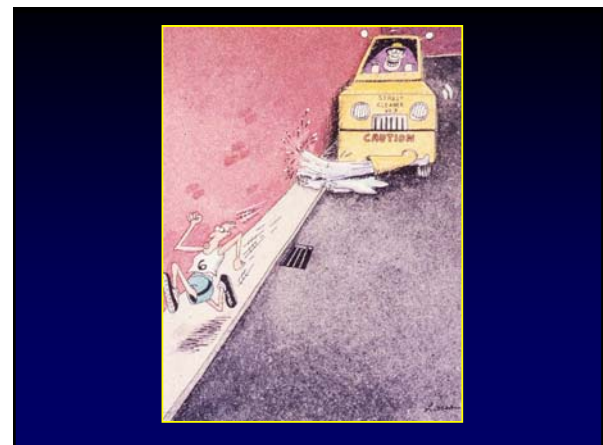
Frank G. Alberts,^{1†} MD, Neal S. ElAttrache,¹ MD, Scott Bissell,^{1§} MD, Karen Mohr,¹ PT, Jason Browdy,¹ MD, Lewis Yocum,¹ MD, and Frank Jobe,¹ MD
 From *Kierlan-Jobe Orthopaedic Clinic, Los Angeles, California, †Hickensack University Medical Partners, Orthopedics and Rehabilitation and Orthopedics of Clayton.



Return to Play Criteria

Quick Board Test

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

Return to Play Criteria

Patients' Reported Outcomes

- ✓ **Subjective Shoulder Questionnaire & Scoring System**

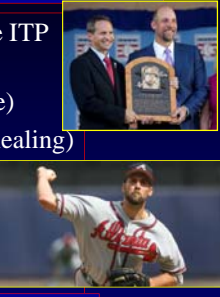


Return to Play Criteria Throwers

Key Points & Conclusions

- ✓ Determining when to initiate ITP can be difficult
- ✓ Strict objective criteria (knee)
- ✓ Time based & assessment (healing)
- ✓ RTP criteria based on:
 - ✓ Clinical exam
 - ✓ Functional tests
 - ✓ Subjective patient

Successful Return to Play Throwing



Wilk - Return to Play Criteria in the
Thrower 2017
SPTS Team Concept Meeting Las Vegas

