

Return to Play for Overhead Athletes Following Superior Labral Repair

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Faculty Disclosure

In compliance with ACCME Guidelines, I hereby declare:

I do not have financial or other relationships with the manufacturer(s) of any commercial services(s) discussed in this educational activity.

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Why Superior Labral Injury?

- Clinical data 2006-2013 for patients under the age of 30 y/o


Year	Total Labral and Capsular Repairs	% Increase
2006	99	-----
2007	121	22%
2008	133	10%
2009	174	31%
2010	201	15%
2011	182	-9%
2012	179	-2%
2013	208	16%



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Question


- **What are you currently telling your athletes about RTP possibility following shoulder surgery?**
 - What level of return?
 - Pre-injured level
 - Any level
 - No return



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Focus

- What do we know about RTP and overhead athletes after superior labral repair?
- What does the literature say?
- What has clinical experience revealed?
- What suggestions can I provide to you?




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Return to pre-injured levels of play following arthroscopic labral repair in overhead athletes

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Sciascia et al JAT 2015



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Labral Roles: Function

Washer/Bearing for Shoulder Joint → Distributes load

compressive forces created by screw
washer
screw
object
load disbursement created by washer

compressive forces created by muscles
load disbursement created by labrum

Background

- **SLAP/Int. Imp. common in overhead athletes**
 - Loss of arm function affecting athletic performance: the "disabled throwing shoulder" (DTS): Burkhart et al Arthroscopy 2003

Biceps tendon

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Background

- **Surgery attempts to restore the functional loss**
 - Arthroscopic repair most common
- **Return to athletic function following arthroscopic SLAP/Int. Imp. repair is a concern of both the patient and clinician**
- **Unclear as to what extent overhead athletes return to pre-injury play following the procedure**

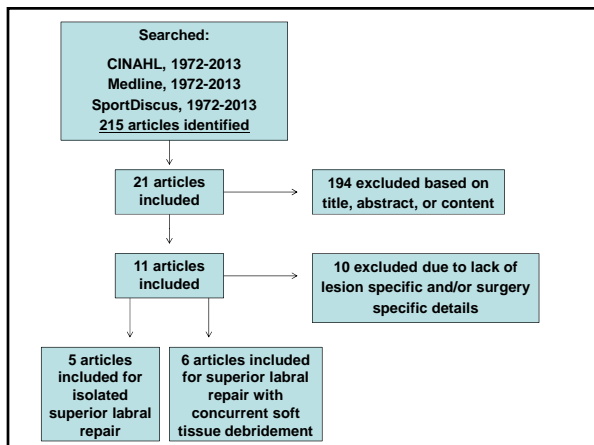
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Search Limits

- Databases
 - CINAHL, Medline, SportDiscus
- Limits
 - English, Human Studies, 1972-2013
- Inclusion
 - Articles reporting surgical repair of an isolated superior labral injury or a labral injury with soft tissue debridement
 - Overhead athletes with a mean age ≤40 years
 - Record of assessment of return to pre-injury level of play
- Exclusion
 - Articles not identifying the type of labral lesion repaired
 - Articles which did not describe surgical technique/procedure
 - Articles determined to be literature reviews (non-systematic reviews) or current concepts/opinion papers



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Odds of RTP

	Full Return	Limited Return	Odds
Overhead	4	14	4/14=.3
Non-overhead	10	6	10/6=1.7

Kim et al JBJS 2002


Non-overhead athletes have 5.8x greater chance to return in full after isolated superior labral repair compared to overhead athletes



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Critical Appraisal


- Intervention study appraisal score sheet described by MacDermid
 - Macdermid J. J Hand Therapy 2004
 - 24 questions divided amongst 7 subsections
 - Score from 0 to 2 (48 points max)
- Scoring sheet was modified to a binary ("yes" or "no") scoring system
- Risk of bias determined
 - Agency for Healthcare Research and Quality



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Results: Isolated Labral Repair

- Mean age: 24-34 years
- Follow-up: minimum 2 years (24-97 months)
- Return to play assessed at follow-up only
 - 22-92% full return
- All retrospective case series
- Critical appraisal
 - 10-15 points (42-62%)



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	Kim et al (2002)	Cohen et al (2006)	Yung et al (2008)	Maier et al (2013)	Park et al (2013)
# Subjects	34 patients 18 overhead	39 patients 8 throwing	16 patients 13 overhead	24 patients 18 overhead	24 patients 24 overhead
Sub Groups	a. Overhead b. Non-overhead	a. Throwing b. Non-throwing	Overhead	a. Suture Anchor b. Transglenoid suture	a. Baseball b. Overhead
Sports	Baseball eluded to but no other sports specified	Baseball, football, hockey, lacrosse, volleyball, skiing	Tennis, handball, cricket	Volleyball, soccer, tennis, boxing, weight lifting, badminton, basketball, swimming, climbing	Baseball, javelin, volleyball, badminton

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	Kim et al (2002)	Cohen et al (2006)	Yung et al (2008)	Maier et al (2013)	Park et al (2013)
Rate Full Return	Overhead: 22% Non-overhead: 63%	Thrower: 37% Non-thrower: 58%	Overhead: 92% Non-overhead: 100%	SA: 56% TS: 67%	Baseball: 37% Other: 75%

	Kim et al (2002)	Cohen et al (2006)	Yung et al (2008)	Maier et al (2013)	Park et al (2013)
Odds for Full Return	Overhead: 0.3 Non-overhead: 1.7	Thrower: 0.6 Non-thrower: 1.4	N/A	SA: 1.3 TS: 2.0	Baseball: 0.6 Other: 3.0
	OR: 5.8	OR: 2.3		OR: 1.6	OR: 5
Appraisal	12 (50%)	10 (42%)	12 (50%)	15 (62%)	10 (42%)

Results: Labral Repair with Debridement

- Mean age: 24-36 years
- Follow-up: minimum 1 year (12-120 months)
- Return to play assessed at follow-up only
 - 41-84% full return
- All retrospective case series
- Critical appraisal
 - 11-17 points (42-70%)



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	Morgan et al (1998)	Ide et al (2005)	Brockmeier et al (2009)
# Subjects	102 patients 53 overhead	40 patients 40 overhead	47 patients 22 overhead
Sub Groups	Overhead	a. Baseball b. Other	a. Overhead b. Other
Sports	Baseball, tennis, volleyball	Baseball, handball, volleyball, basketball, softball, racquetball, soccer, swimming	Baseball, tennis, softball, swimming, volleyball, squash

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	Morgan et al (1998)	Ide et al (2005)	Brockmeier et al (2009)
Rate Full Return	Pitchers: 84%	Baseball: 63% Other: 86%	Overhead: 71% Other: 74%

	Morgan et al (1998)	Ide et al (2005)	Brockmeier et al (2009)
Odds for Full Return	N/A	Baseball: 1.7 Other: 6.0 OR: 3.5	Overhead: 2.5 Other: 5.0 OR: 2
Appraisal	11 (46%)	17 (70%)	15 (62%)

	Friel et al (2010)	Park et al (2011)	Neri et al (2011)
# Subjects	48 patients 23 overhead	6 overhead	23 overhead
Sub Groups	a. Overhead b. Non-overhead	Overhead	a. SLAP b. SLAP/RC
Sports	Baseball, volleyball, tennis	Baseball, softball, volleyball	Baseball, volleyball, tennis, water polo

	Friel et al (2010)	Park et al (2011)	Neri et al (2011)
# Subjects	48 patients 23 overhead	6 overhead	23 overhead
Sub Groups	a. Overhead b. Non-overhead	Overhead	a. SLAP b. SLAP/RC
Sports	Baseball, volleyball, tennis	Baseball, softball, volleyball	Baseball, volleyball, tennis, water polo


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Sub Groups	a. Overhead b. Non-overhead	Overhead	a. SLAP b. SLAP/RC
Sports	Baseball, volleyball, tennis	Baseball, softball, volleyball	Baseball, volleyball, tennis, water polo

	Friel et al (2010)	Park et al (2011)	Neri et al (2011)
Return Rate	Overhead: 56% Non-overhead: 67%	Overhead: 0-20%	SLAP: 57% SLAP/RC: 13%

	Friel et al (2010)	Park et al (2011)	Neri et al (2011)
Odds Ratio	Overhead: 1.3 Non-overhead: 2.0 OR: 1.5	N/A	SLAP: 4.0 SLAP/RC: 0.1 OR: 28
Appraisal	14 (58%)	10 (42%)	12 (50%)

Superior Labral Repair with Concurrent Debridement

- Both groups had positive chance of success
 - Odds all greater than 1
- But why???
- 8.5 more overhead patients in concurrent procedure group
- Superior labral injury not occurring in isolation
- Optimum method to treat labral pathology not fully understood




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Study	Number of Anchors Reported	Anchor Location Described
Kim et al 2002	At least 1	Base of biceps
Cohen et al 2006	1-4	Where indicated
Yung et al 2008	2-4	2 o'clock to 10 o'clock
Maier et al 2013	1-2	Where indicated
Park et al 2013	At least 1	12 o'clock for double loaded anchor, 11 o'clock and 1 o'clock for single loaded anchor
Morgan et al 1998	No	Articular margin
Ide et al 2005	At least 2	11 o'clock to 1 o'clock
Brockmeier et al 2009	At least 1	Articular margin not beyond 10 o'clock
Friel et al 2010	At least 1	Base of biceps to 11 o'clock
Park and Glousman 2011	No	No
Neri et al 2011	Mean 2.3	On either side of biceps

Limitations


- Inconsistent definition of overhead/throwing athlete
- Wide range of age and follow-up time
 - Mean age 24-36 across all studies
- No determination of sample size
 - Lack of a thorough statistical analysis
 - Confounding variables not accounted for
- Rehabilitation details not reported
- **Evident biases exist**
 - **Recall (100%)**
 - **No prospective assessment of pre-injured ability**



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Conclusions

- Use of odds reduces noise in literature showing consistent trend of non-overhead athletes having greater success with superior labral surgery
- Limitations within studies and variations between studies limits strength of findings
- Labral surgery should not be abandoned
 - Treat based on functional deficit and demands




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Recommendations

- Be comfortable stating:
 - Overhead athletes can return to activity following superior labral repair

 - We cannot guarantee return to pre-injured activity level not because the surgery is bad, but solid information doesn't exist

 - Non-overhead athletes do have better odds of returning to full activity (at least 2x better)



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What about non-operative treatment?



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Give Rehabilitation a Chance


- 68 MLB players with verified SLAP lesions
 - Pitchers
 - 21 no surgery: RTP=40%, Pre-injured return=22%
 - 24 surgical: RTP=48%, Pre-injured return=7%
 - Position Players
 - 10 no surgery: RTP=39%, Pre-injured return=26%
 - 13 surgical: RTP=85%, Pre-injured return=54%
 - Fedoriv et al AJSM 2014



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Give Rehabilitation a Chance

- 19 patients with SLAP treated non-operatively
 - ASES pain and function improved
 - Pain decreased from 4.5 to 2 (p=.04)
 - Function increased from 31/50 to 45/50 (p<.001)
 - All athletes pre-injured return=71%
 - Overhead athlete pre-injured return=66%
 - Edwards et al AJSM 2010



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How Do We Overcome The Issues?




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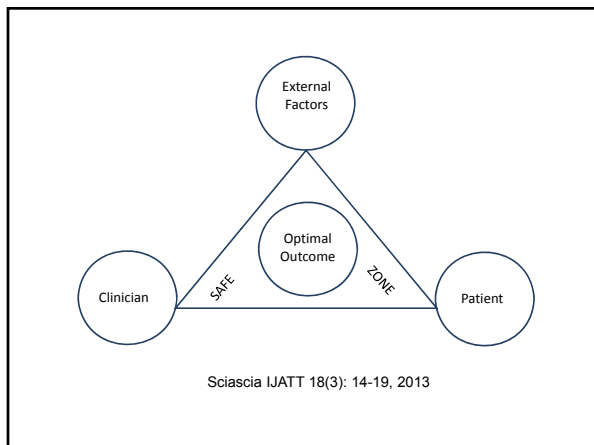
Establishing Pre-Season Self-Reported Functional Outcomes Scores for Overhead Athletes

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Jean Lucas, PT, DPT
Tim Uhl, PhD, ATC, PT, FNATA

Information from larger data from Sciascia et al JAT 2015




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Background

- The goal of rehabilitation is to return the athlete to pre-injured levels; however:
 - prospective pre-injured levels of function are not routinely documented and thus not utilized
- Outcomes collection begins at a time of dysfunction




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How difficult is it for you to get loose or warm prior to competition or practice?	
Never feel loose during games or practice	Normal warm-up
How much pain do you experience in your shoulder or elbow?	
Pain at rest	No pain with competition
How much weakness and/or fatigue (i.e. loss of strength) do you experience in your shoulder or elbow?	
Weakness or fatigue preventing any competition	No weakness, normal competition fatigue
How unstable does your shoulder or elbow feel during competition?	
"Popping out" routinely	No instability
How much have arm problems affected your relationship with your coaches?	
Left team, cut, or lost scholarship	Not at all

How much have you had to change your throwing motion, serve, stroke, etc. due to your arm?	
Completely changed, don't perform motion anymore	No change in motion
How much has your velocity and/or power suffered due to your arm?	
Lost all power, became finesse or distance athlete	No change in velocity/power
What limitation do you have in endurance in competition due to your arm?	
Significant limitation (became relief pitcher, switched to short races for example)	No endurance limitation in competition
How much has your control (of pitches, serves, strokes, etc.) suffered due to your arm?	
Unpredictable control on all pitches, serves, strokes, etc.	No loss of control
How much do you feel your arm affects your current level of competition in your sport (i.e. is your arm holding you back from being at your full potential)?	
Cannot compete, Had to switch sports	Desired level of competition

Background


- Pre-season assessment of arm capability has been conducted in professional baseball players
 - Asymptomatic players: ≥90/100
 - Kraeutler et al JSES 2013
 - Franz et al AJSM 2013
 - No history of injury: 97/100
 - History of injury: 84-87
 - Franz et al AJSM 2013
 - Fronek et al JSES 2014



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Background


- Assessment of arm capability in swimmers during fall practice
 - Not currently injured: 84/100
 - Currently injured: 54/100
 - Years competing
 - ≤10 years: 86
 - ≥11 years: 72
 - Wymore and Fronck AJSM 2015



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Questions


- What are the average KJOC values of subjective functional scores at the beginning of a competitive season for collegiate overhead athletes?
- Is there a difference in subjective scores between athletes with and without a history of injury?
- Is there a difference either within or between sexes?



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Methods


- Pre-participation physical examinations at physician offices and athletic facilities
- Athletes 17-32 years old
 - Baseline measure all overhead athletes
- Demographics, KJOC
 - KJOC scale 0-100 (low to high function)
 - Alberta et al AJSM 2010



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Statistical Analysis


- Summary statistics
 - Demographic variables
 - Overall score medians
- Non-parametric statistics
 - Differences between history and no history of injury within and between sexes
 - Mann-Whitney U
- Significance set at $p < .05$
 - Removed athletes with elbow injury



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Results


- 168 overhead athletes completed surveys
 - Age: 19±2 (94 F, 74 M)
 - 5 colleges
 - 5 sports
 - Baseball (51)
 - Volleyball (45)
 - Swimming (35)
 - Softball (27)
 - Tennis (10)
 - Years playing: 11±4
- History of injury
 - No injury ever: 114 (68%)
 - Injury ever: 54 (32%)
 - 25 of 54 injured in past year
- Overall KJOC Score: 97/100



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Results: Shoulder Injury


	N	Mean (SD)	95% CI	Median	P-Value
<i>Injury</i>	54	78 (21)	72-83	81	P<.001
<i>No Injury</i>	114	96 (7)	95-98	98	



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Results: Sex


	N	Mean (SD)	95% CI	Median	P-Value
Female					
<i>Shoulder Injury</i>	25	74 (22)	65-84	80	P<.001
<i>No Injury</i>	68	97 (4)	95-98	98	



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Results: Sex


	N	Mean (SD)	95% CI	Median	P-Value
Female					
<i>Shoulder Injury</i>	25	74 (22)	65-84	80	P<.001
<i>No Injury</i>	68	97 (4)	95-98	98	
Male					
<i>Shoulder Injury</i>	29	81 (19)	73-88	88	P<.001
<i>No Injury</i>	45	96 (9)	93-99	99	



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Results: Injury Time


	N	Mean (SD)	95% CI	Median	P-Value
<i>Injury ≤1 year</i>	25	68 (23)	58-77	70	P<.001
<i>Injury ever</i>	29	86 (14)	81-92	92	



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Key Points


- History/current injury affects perceived physical capability in overhead athletes
 - Franz et al AJSM 2013
 - Fronek et al JSES 2014
 - Wymore and Fronek AJSM 2015
- Reported in other joints as well
 - Cameron et al AJSM 2013
 - Sciascia et al JAT (in press)
- Females perceived lower physical capability than males
 - Ageberg et al AJSM 2010
 - Naylor and McBeath Percep Psycho 2008
 - John and Ebbeck Sex Roles 2008
 - Bekker et al Pers Ind Diff 2002



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Conclusions


- Medically qualified overhead athletes with previous injury have perceived lower physical capability prior to a competitive season.
- This self-assessment of joint specific capability may supplement pre-season physicals and indicate a need for further monitoring or care for individual athletes.



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What About Functional Testing?


- The literature is limited in identifying a “best” test for the upper extremity
- Suggestion to change terminology to Physical Performance Measure
 - Reiman and Manske J Man Manip Ther 2011
- Let’s look at what is out there and what information we have



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Physical Performance Measures


- Push-ups
- Closed kinetic chain upper extremity stability test
- Y-balance test
- Softball throw for distance
- Seated shot-put for distance (2 arm)
- PSET
- Seated shot-put for distance (1 arm)
- 1-RM estimate
- 1-arm hop test
- Sitting throw test
- Modified pull-up




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Push-Ups

- Excellent test/re-test reliability
 - Baumgartner et al Measure Phys Ed Ex Sci 2002
 - Negrete et al JSCR 2010
- Reference data
 - Baumgartner et al Measure Phys Ed Ex Sci 2002
 - Negrete et al JSCR 2010
- Correlated with bench press
 - Baumgartner et al Measure Phys Ed Ex Sci 2002




Negrete et al JSCR 2010




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Closed Kinetic Chain Upper Extremity Stability Test

- Excellent test/re-test reliability
 - Goldbeck and Davies JSR 2000
 - Tucci et al BMC Musculo Dis 2014
 - Sciascia and Uhl USPT 2015
- Reference data
 - Ellenbecker et al Orthop Phys Ther Clin North Am 2000
 - Roush et al N Am J Sport Phys Ther 2007
- Injury prediction
 - Pontillo et al Sports Health 2014









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Y-Balance Test

- Excellent test/re-test reliability
 - Gorman et al JSCR 2012
 - Westrick et al IJSPT 2012
- Correlated with push-ups and CKQUEST
 - Westrick et al IJSPT 2012
- No difference between sexes
 - Gorman et al JSCR 2012


Gorman et al JSCR 2012



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Concerns


- Value unknown in persons with a specific shoulder pathology or shoulder pain
 - CKQUEST examined in SIS but SIS group was 24 years older than healthy group (50 vs. 26 years old)
 - Tucci et al BMC Musculoskel Dis 2014
- Value unknown for determining RTP in overhead athletes
- Are weight bearing maneuvers ideal for making decisions involving open chain tasks?



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Recent Findings

<ul style="list-style-type: none"> • Asymptomatic <ul style="list-style-type: none"> - 18 subjects - 8 male, 10 female - 29 ± 7 years - 171 ± 7 cm - 71 ± 14 kg - ASES <ul style="list-style-type: none"> • Dominant: 99 ± 2 • Non-Dominant: 99 ± 1 	<ul style="list-style-type: none"> • Symptomatic <ul style="list-style-type: none"> - 18 subjects - 9 male, 9 female - 30 ± 8 years - 172 ± 12 cm - 76 ± 15 kg - ASES <ul style="list-style-type: none"> • Involved: 67 ± 15 • Non-Involved 98 ± 6
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Recent Findings







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Recent Findings

Asymptomatic Group n=18	Scaption		CKCUEST	1-RM Estimate	
	Dominant	Non-Dominant		Dominant	Non-Dominant
ICC	0.98	0.98	0.85	0.96	0.94
Mean	12kg	12kg	22 touches	8kg	8kg
SD	4kg	4kg	5 touches	4kg	4kg
SEM	1kg	1kg	2 touches	1kg	1kg
MDC ₉₀	1kg	1kg	4 touches	2kg	2kg

Sciascia and Uhl IJSPT 2015

Recent Findings


Asymptomatic Group n=18	Scaption		CKCUEST	1-RM Estimate	
	Dominant	Non-Dominant		Dominant	Non-Dominant
ICC	0.98	0.98	0.85	0.96	0.94
Mean	12kg	12kg	22 touches	8kg	8kg
SD	4kg	4kg	5 touches	4kg	4kg
SEM	1kg	1kg	2 touches	1kg	1kg
MDC ₉₀	1kg	1kg	4 touches	2kg	2kg

Symptomatic Group n=18	Scaption		CKCUEST	1-RM Estimate	
	Involved	Non-Involved		Involved	Non-Involved
ICC	0.97	0.95	0.86	0.93	0.93
Mean	12kg	13kg	22 touches	10kg	10kg
SD	4kg	4kg	5 touches	4kg	5kg
SEM	1kg	1kg	2 touches	1kg	1kg
MDC ₉₀	2kg	2kg	4 touches	3kg	3kg

Sciascia and Uhl IJSPT 2015

Recent Findings

- No difference in strength output for either isometric or 1-RM estimate between arms in either group
- Non-involved arm in symptomatic group could lift 1.5kg (3lbs) more than either arm in asymptomatic group
 - Subjects may have learned how to better utilize the non-involved arm
 - Upper extremity can adapt because of limb independence




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Recent Findings

- CKQUEST better than strength testing at distinguishing between people with and without shoulder symptoms
 - Only when normalized to body weight
 - Shoulder symptoms = 3% less touches


	Asymptomatic	Symptomatic	P-value
Isometric	16%	16%	P=0.89
1-RM Estimate	12%	12%	P=0.36
CKQUEST	32%	29%	P=0.064



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Recommendations

- Still no “best” test
- CKQUEST has been examined the most and starting to look like a potential maneuver to utilize
- Traditional strength tests (MMT, lifting tasks) may not be best choice for RTP decisions



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Return to Play for Overhead Athletes

- Existing literature is low to moderate quality
- Non-overhead athletes have 2x greater odds of RTP following superior labral repair
- History of injury affects outcome score in medically qualified athletes
- Physical performance testing could assist clinicians for a variety of overhead athletes but it's too early to commit to specific tests



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THANK YOU