

Upper Extremity Return to Play

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Learning Objectives

- At the conclusion of the presentation, the participant should be able to:
- Explain what functional tests are best to be used with UE return to play decisions.
- Identify the tools needed to assist in making RTP decisions.
- Demonstrate the use of total arc in measuring shoulder ROM for UE athletes.
- Develop and understand a matrix of objective measures to assist with UE return play decisions.
- Recommend a return to play rehabilitation protocol for patients with UE injuries.



Who is this guy?

- BS in Health Promotion from the University of Iowa
- Doctorate in Physical Therapy from the University of Indianapolis
- 9.5 years of clinical experience
- Certified Strength and Conditioning Specialist



Agenda

- Strength and ROM
- Upper Extremity Functional Tests
- Outcome Measures
- Mechanics
- Throwing Protocol
- RTP Matrix



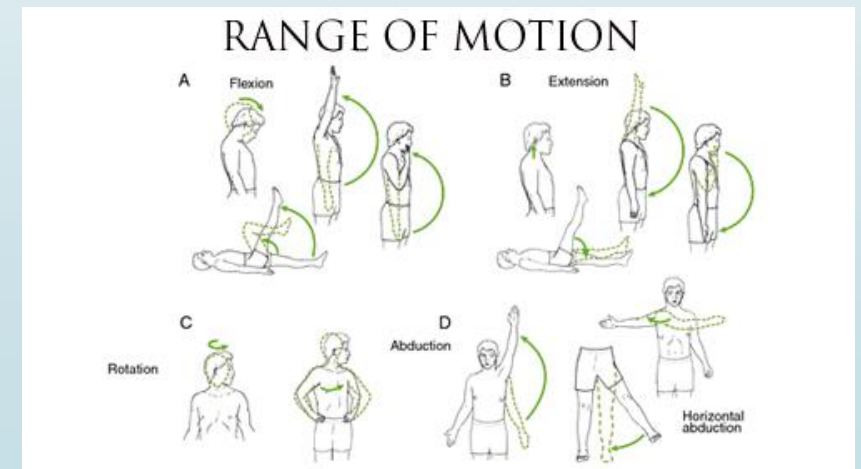
Strength and ROM

► Strength

- Equal side to side
- Isokinetic testing¹
 - Gold standard
 - Not practical
- Manual Muscle testing
 - Hand held dynamometer²
- Functional strength tests

► ROM

- Equal side to side
- Total Arc
 - $IR + ER = \text{Total Arc}$



Shoulder Overview Range of Motion – Active & Passive

General Population PROM Throughout the Age Spectrum

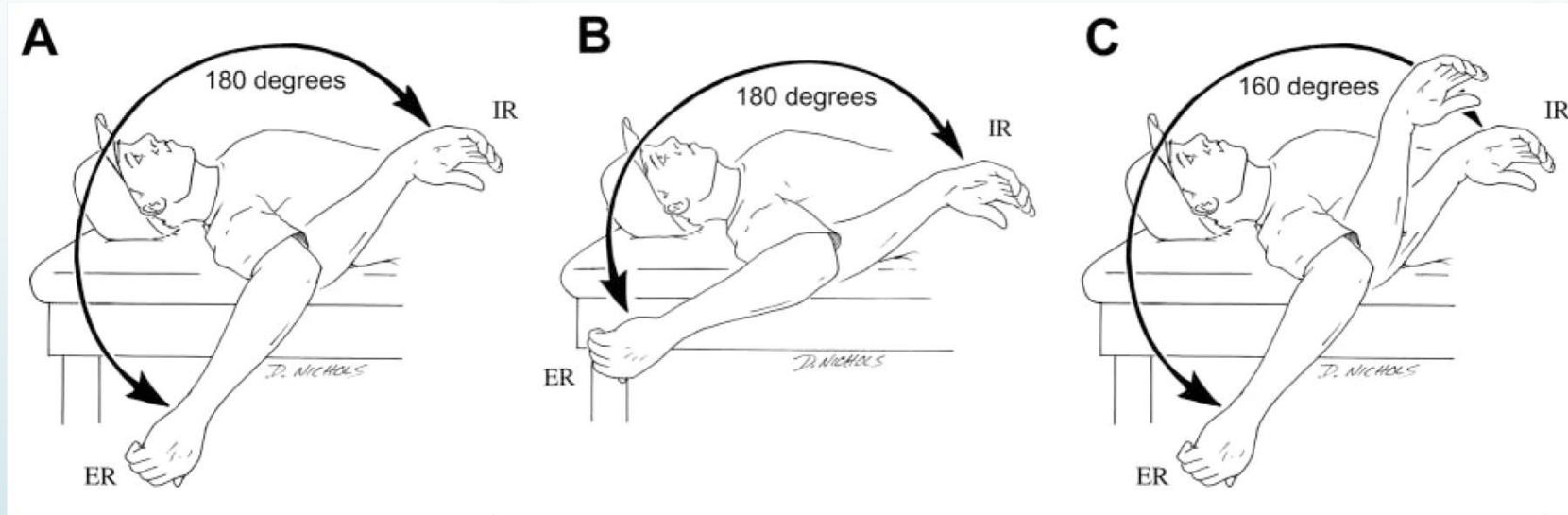
Motion	10-19 years ³	20-39 years ³	40-54 years ³	60-85 years ⁴
FLEX	167.4	165	165.1	160
EXT	64	58	56.1	38
IR	70.3	66.5	68.3	59
ER	106.3	101	97.5	76
ABD	185.1	182.7	182.6	155

Athletic Population PROM & AROM

Motion	Baseball Players PROM ⁵	Baseball Players AROM ⁶	Tennis Players AROM ⁶
ER	129.9	103.2	103.7
IR	62.6	42.4	45.4

Total Motion Concept – “Total Arc”

Definition



The total motion concept. The combination of external rotation (ER) and internal rotation (IR) equals total motion and is equal bilaterally in overhead athletes, although shifted posteriorly in the dominant (A) versus non-dominant (B) shoulder. Pathological loss of internal rotation will result in a loss of total motion (C).⁷

Upper Extremity Functional Tests

- Seated Medicine Ball Throw
- Single Arm Seated Shot Put Test
- Timed push up test
- Modified pull up test
- Upper Quarter Y Balance Test
- Closed Kinetic Chain Upper Extremity Stability Test
- Assessment of mechanics



Seated Medicine Ball Throw⁸

- Sit on the floor with back against the wall, legs extended and apart for balance
- Bring ball to chest and throw while keeping the back against the wall
- Best of 3 trials
- Males use 6 lb. ball, Females 4 lb. ball
- Formerly used by the NHL in their combine

Rating	Distance (Meters)
Excellent	5.76+
Good	5.00-5.75
Average	4.25-4.99
Below Average	3.50-4.24
Poor	0-3.49

Seated Medicine Ball Throw

- Highly reliable test of upper body power in older adults⁸
- Associations of Upper Body Power Tests and Upper and Lower Body Power in ROTC Cadets⁹
 - Push-up test, seated MB, vertical jump
 - Significant relationship between push up and MB in Females, but not males
- Reliable low cost alternative to isokinetic testing in clinical setting¹⁰
- Inexpensive, safe and repeatable



Single Arm Seated Shot Put Test¹¹

- Seated in a chair without armrests
- Feet and legs placed on chair in front
- Nonthrowing arm placed across the chest and a strap placed across the chest to secure the subject to the chair
- 6 lb. medicine ball
- 4 warm up puts and then 3 trials
- At least 90% symmetry in distance side to side
- Minimal detectable change
 - Dominant arm 17 inches
 - Non dominant arm 18 inches



Timed Push up Test¹¹

- Widely used in lots of settings to test upper body strength
 - Gym class, military tests
- Reliability, minimal detectable change and normative values
 - Significant reliability
 - 90% confidence in minimal detectable change represents true improvement (2 reps)
- How many you can do in 1 minute
 - Male: > 18 reps, Female: > 12 reps
- Also can do to exhaustion¹²
 - Male: >39, Female: >27
- Safe, inexpensive, repeatable, practical



Modified Pull-up Test¹³

- Used in schools age 5-15
- Test of strength focused on the back, shoulder, forearm, and arm strength
- Complete as many as possible until break form or pause for more than 2 seconds
- Safe, inexpensive, repeatable, practical

Boys	Girls
5-6 \geq 2 7 \geq 3	5-6 \geq 2
8 \geq 4 9-10 \geq 5	7 \geq 3
11 \geq 6 12 \geq 7	8-15 $>$ 4
13 \geq 8	
14 \geq 9	
15 \geq 10	

Modified Pull-up Test

- Adjustable bar positioned to allow participant to grab bar with back flat on surface. Strap hangs down 8 inches and chest has to touch strap.



Upper Quarter Y Balance Test^{14, 15, 16}

- Weight bearing on the contralateral limb
- Test medial reach, inferolateral reach, superolateral reach
 - Start with right and do in that order, repeat on left
 - Best of 3 trials, allowed 1 practice trial
- Reach as far as possible without loss of balance
 - Challenges balance, proprioception, strength and ROM
- Normalize reach distance
 - Measure arm length from C7 to the most distal tip of the right middle finger
- Must have good form
 - Cannot touch down with reach hand, fall off platform, shoved the sliding platform, used sliding platform for support, failed to come back to starting position, and lifted feet off floor



Upper Quarter Y Balance Test

- Reliable test for measuring UE reach in a closed chain position¹³
- No difference in baseball and softball players¹⁶
- No difference in throwing and non-throwing in un-injured athletes¹⁶
- Not at good measure of strength¹⁰



Closed Kinetic Chain Upper Extremity Stability Test^{17,18,19}

- Push up position, or modified push up position
- Hands 36 inches apart
- Count how many times one hand can touch the other hand in 15 secs
 - Hand must come back to the starting position each time
- 3 trials with rest up to 45 secs between sets



Closed Kinetic Chain Upper Extremity Stability Test

- Improvement of 3-4 touches is considered significant¹⁷
- Reliable tool for healthy, subacromial impingement, and different levels of physical activity¹⁷
- Collegiate-level baseball players no differences existed in scores by position ¹⁸
- Clinically relevant for use in upper extremity function ¹⁸
- Safe, inexpensive, repeatable, practical



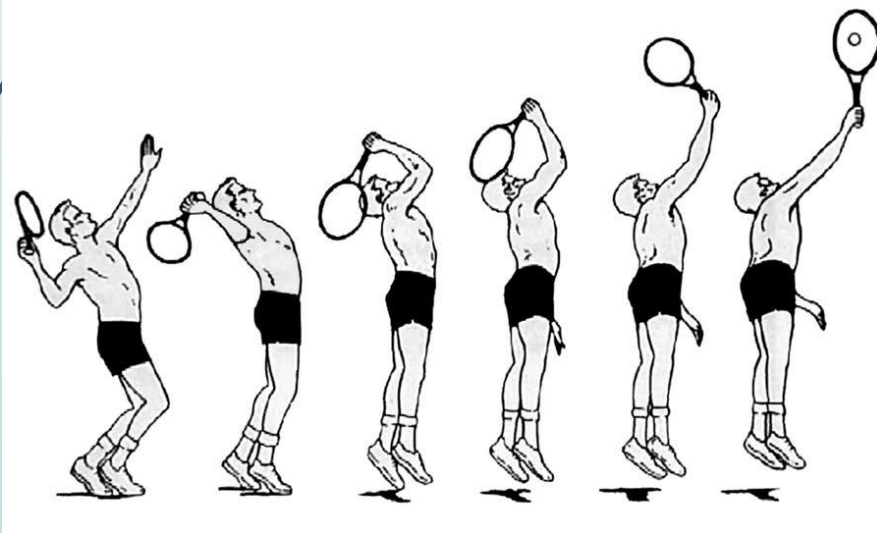
Outcome Measures

- Injury-Psychological Readiness to Return to Sport scale
 - 6 questions (confidence)²⁰
- FOTO
- SPADI
- DASH
- Bottom line: use something that is a valid measure

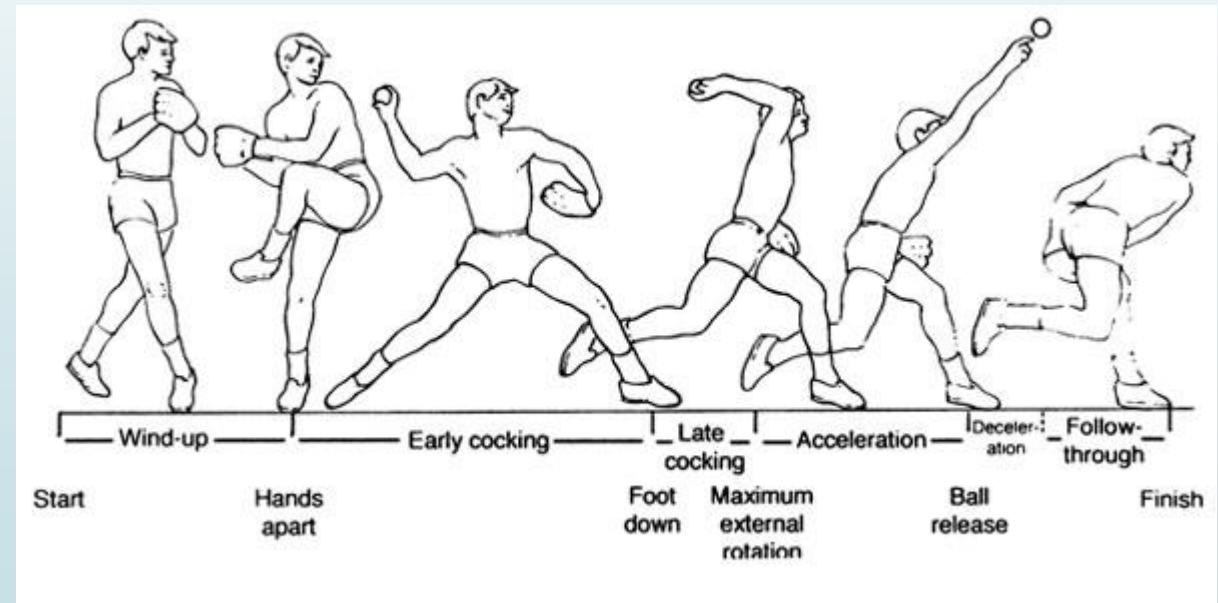
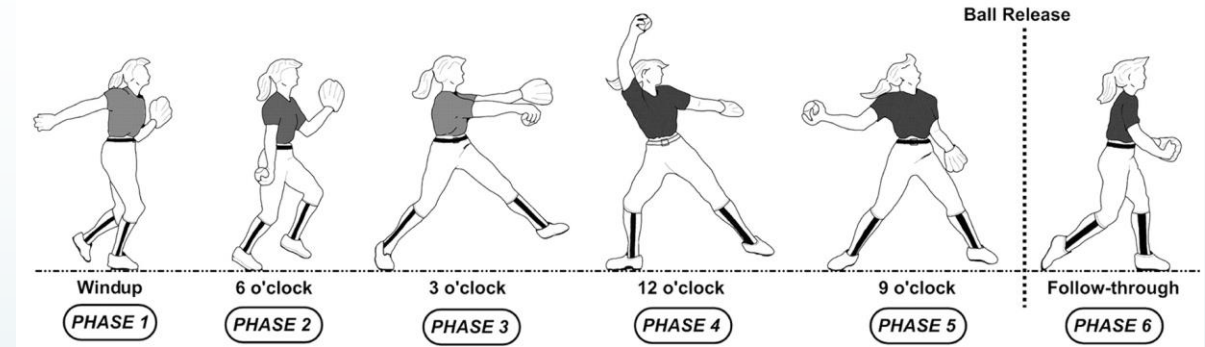


Mechanics

- Proper Mechanics are important
- Know your sport
 - Baseball is different than tennis
 - Don't have to be an expert
- Position matters as well
 - Softball pitcher vs baseball pitcher
- Video Analysis



Windmill Pitching Phases



Throwing Protocol ²¹

- Warm up
 - Break a sweat
 - Stretches
- Throwing Program
- Strength exercises
- Stretches
- Ice



Throwing Protocols ²¹

Short Toss Program

	Phase I	Phase II	Phase III	Phase IV	Phase V
Short Toss Feet	20	30	40	46	46
Rest time	12 sec/throw 6-8 mins/set	12 sec/throw 6-8 mins/set	12 sec/throw 6-8 mins/set	12 sec/throw 6-8 mins/set	12 sec/throw 6-8 mins/set
Throws	Set 1 15 Set 2 15 Set 3 20	Set 1 15 Set 2 15 Set 3 20	Set 1 15 Set 2 15 Set 3 20	Set 1 15 Set 2 20 Set 3 20	Set 1 15 Set 2 20 Set 3 20
Intensity	Work to tolerance	Work to tolerance	Work to tolerance	Up to ½ speed	Up to ¾ speed

Throwing Protocols ²¹

Short Toss Program

	Phase VI	Phase VII	Phase VIII	Phase IX
Short Toss Feet	46	46	46	Simulated Game
Rest time	12 sec/throw 6-8 mins/set	12 sec/throw 6-8 mins/set	12 sec/throw 6-8 mins/set	
Throws	Set 1 20 Set 2 20 Set 3 20	Set 1 20 Set 2 20 Set 3 25	Set 1 15 Set 2 25 Set 3 25	
Intensity	Mound, full speed	Mound, full speed: breaking ball 3:1	Mound, full speed: breaking ball 3:1	

Throwing Protocols ²¹

Long Toss Program (Rest 10 mins between short and long toss)

	Phase I	Phase II	Phase III	Phase IV	Phase V
Long Toss Feet	65% target distance	70% target distance	75% target distance	80% target distance	85% target distance
Rest time	12 sec/throw	12 sec/throw	12 sec/throw	12 sec/throw	12 sec/throw
Throws	25	25	25	25	25
Intensity	to tolerance	to tolerance	to tolerance	to tolerance	to tolerance

Throwing Protocols ²¹

Long Toss Program (Rest 10 mins between short and long toss)

	Phase VI	Phase VII	Phase VIII	Phase IX
Long Toss Feet	90% target distance	95% target distance	100% target distance	Simulated Game
Rest time	12 sec/throw	12 sec/throw	12 sec/throw	
Throws	25	25	25	
Intensity	to tolerance	to tolerance	to tolerance	

Throwing Protocol ²¹

- Soreness Rules for advancement to the next phase
 - If sore more than 1 hour after throwing, or the next day, take 1 day off and repeat the most recent throwing program workout
 - If sore during warmup but soreness is gone within the first 15 throws, repeat the previous workout. If shoulder/elbow becomes sore during this workout, stop and take 2 days off. Upon return to throwing, drop down 1 phase.
 - If sore during warm-ups and soreness continues through the first 15 throws, stop throwing and take 2 days off. Upon return to throwing, drop down 1 phase.
 - If no soreness, advance 1 phase every throwing day.
 - Do not advance more than 2 phases per week.
 - Vanderbilt Sports Medicine Interval Throwing Program for Little League Age Athletes
 - Michael J. Axe, MD American Journal of Sports Medicine Vol 24 No. 5 1996 Interval Throwing Program for Little League aged Athletes



RTP Guided Matrix

Phase 1 - Early Rehab to return to light training/exercise

	No Pain at Rest
	Pain less than 4/10 during activity
	Pain lasting less than 48 hours after activity
	Acceptable scores on psychometric testing (FOTO, DASH, ASES, KJOC)
	No/Trace Edema
	100% symmetrical ROM to other UE (for overhead athletes, check total arch)
	Within normative ranges for sport when available
	Minimum of 5/5 per MMT of involved and adjacent joints
	FMS score >14

Phase 2 - to allow for graduated return to sport training

	Upper Quarter Y-Balance Test (Right vs. Left symmetry)
	Single Arm Seated Shot Put Test (< 10% difference Right vs. Left)
	Timed Push-Up Test (Men: > 18 reps? , Female: > 12 reps?)
	Modified Pull-Up Test (Men: > ???, Female: ???)
	Closed Kinetic Chain Upper Extremity Stability Test (Male: *** reps. Female: *** reps) (>21 touches)

Phase 3 - To allow for full return to sport participation

	Throwing
	Beyond body weight, weight bearing activities (???)
	Greater than body weight, pulling activities (???)
	Sport/position specific progressions

Key Points to Remember ^{22,23}

- Collaborative decision/Collaborative effort
- Fear of re-injury
 - Could be biggest thing holding back the athlete
- Numerous factors
- Objective data is important
- Mimic the sport, know the sport
- Remember Rehab improvement is Non-linear process
 - Important to tell your athlete



Other things

- Don't forget about the whole body ²⁴
 - Baseball players diagnosed with ulnar collateral ligament tears demonstrate decreased balance compared to healthy controls
- FMS or SFMA
- Thoracic ROM and movement
- Core strength
- Hip mobility
- Bilateral comparisons



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Thank You

