

RETURN-TO-THROWING PROTOCOL

Return to Throwing — Adult

Interval Throwing Program · Ages 18 and Older

FOR THE PHYSICAL THERAPIST

How to Use This Program

This interval throwing program (ITP) is the universal return-to-throwing vehicle for adult athletes recovering from shoulder or elbow injury or surgery — UCL reconstruction or repair, labral repair, rotator cuff repair, or nonoperative treatment. The program structure is the same regardless of diagnosis; what changes by diagnosis is **when** the athlete is cleared to begin (the entry criteria) and the **pace** of progression.^{1,2,3}

The program is built on progressive loading of distance, volume, and effort, with pain as the primary monitoring variable. It is criterion-based, not calendar-based: in a study of 717 professional pitchers, the timing of throwing milestones varied widely but did not correlate with return-to-play outcomes — individualized, criteria-based progression matters more than rigid timelines.⁹

DO NOT BEGIN UNTIL ENTRY CRITERIA ARE MET AND DR. ROTH HAS CLEARED THROWING

The entry criteria below must be satisfied before the first throw. Starting a throwing program before the shoulder or elbow is ready is a common cause of setbacks and re-injury. The specific week at which an athlete becomes eligible is set by the source injury's rehabilitation protocol (see the KMR PT protocol for the relevant procedure).

Universal Entry Criteria — Before the First Throw

Regardless of diagnosis, every athlete should meet all of the following before initiating the throwing program.^{2,3}

Domain	Requirement
Range of motion	Full, pain-free shoulder and elbow ROM equal to the contralateral side — particular attention to shoulder ER/IR and elbow extension
Strength	Rotator cuff and scapular stabilizer strength $\geq 80\%$ of contralateral side (MMT or dynamometry)
Symptoms	No pain or tenderness at the surgical/injury site with provocative testing; no shoulder or elbow effusion
Scapular mechanics	Normalized scapular mechanics — no scapular dyskinesis on clinical exam
Plyometric phase	Successful completion of a plyometric progression (weighted-ball tosses, two-hand overhead throws, chest passes) before the first throw
Kinetic chain	Core and lower-extremity strength adequate for throwing mechanics (single-leg squat control, hip IR/ER symmetry)

WHEN TO START, BY DIAGNOSIS (clinician reference)

Typical week the athlete becomes eligible to begin this program — always gated by the entry criteria above, not the calendar:

- **UCL reconstruction:** ~16 weeks (range 12–18)
- **UCL repair (internal brace):** ~12–14 weeks
- **UCL sprain (nonoperative):** after symptom resolution, ~4–8 weeks
- **Arthroscopic labral repair (Bankart/SLAP):** ~12–16 weeks post-op
- **Arthroscopic rotator cuff repair:** ~16–20 weeks post-op

Rules of Progression

- **Throwing days only.** Perform each step on throwing days with a minimum of one rest day between sessions.
- **Advance on two clean sessions.** Advance to the next step only after completing the current step pain-free on two consecutive sessions.
- **Warm up first.** Every session begins with a dynamic warm-up and arm-care band work, then the plyometric ball progression, before throwing.
- **Pain means stop.** If pain occurs during throwing, stop immediately and follow the setback protocol below.

Phase 1 — Flat-Ground Long Toss

Weeks 1–6 of the program. All throws begin at $\leq 50\%$ effort, progressing to $\sim 75\%$ by the end of the phase. Throw on an arc; focus on smooth mechanics.^{6,8}

STEP	DISTANCE	THROWS	EFFORT	FREQUENCY
1	45 ft (13.7 m)	25	50%	Every other day
2	60 ft (18.3 m)	25	50%	Every other day
3	75 ft (22.9 m)	25	50–60%	Every other day
4	90 ft (27.4 m)	25	50–60%	Every other day
5	105 ft (32 m)	25	60%	Every other day
6	120 ft (36.6 m)	25–30	60–70%	Every other day
7	135 ft (41.1 m)	25–30	70%	Every other day
8	150 ft (45.7 m)	25–30	70–75%	Every other day

WHY LONG TOSS STOPS AT ~150 FEET

Elbow varus torque increases with throwing distance up to about 120 ft and then plateaus, so distances beyond ~150 ft add injury risk without meaningful conditioning benefit. Most published programs cap long toss at 150 ft (range 90–250).^{18,19}

Phase 2 — Pull-Down / Line-Drive Throws

Weeks 6–8 of the program. Shorten the distance back to 60–90 ft and increase effort to 75–85%. Throw on a line rather than an arc, simulating game mechanics. 25–30 throws per session, every other day, focusing on mechanics and release point.^{6,8}

Phase 3 — Flat-Ground Pitching

Weeks 8–10 of the program. Throw from pitching distance (60 ft 6 in) on flat ground. Begin with fastballs only at 50–60% effort, 15–20 pitches; progress to 25–30 fastballs at 70–75%. Introduce off-speed pitches — changeup first, then breaking ball — once the fastball is pain-free at 75%. Every other day.^{6,8}

Phase 4 — Mound Progression (Pitchers)

Weeks 10–14 of the program. Pitchers only — position players proceed to Phase 5. All pitching from the mound at regulation distance.^{1,6,9}

STEP	PITCH COUNT	EFFORT	PITCH TYPES	REST
1	15–20	50–60%	Fastball only	2 days
2	25–30	60–70%	Fastball only	2 days
3	30–40	70–75%	Fastball + changeup	2 days
4	40–50	75%	All pitches	3 days
5	50–60	75–80%	All pitches	3–4 days
6	60–75	80–85%	All pitches	4 days

Mean first mound throw after UCL reconstruction occurs at approximately 9.4 months post-op (range 5.3–22.2) — a reminder that mound work is gated by readiness, not a fixed date.⁹

Phase 5 — Simulated Game / Live Batting Practice

Weeks 14–18 of the program. Live BP sessions of 3–4 innings progressing to 5–6; simulated games with the full pitch repertoire; effort progressing to 85–100%. Monitor pitch count, velocity, and symptoms. Maximum mound pitches before return to game play averages ~85 (range 40–120) across published programs.⁸

Phase 6 — Return to Competition

Clearance requires completion of the full program without symptoms, full velocity, full pitch repertoire, and adequate pitch-count endurance. The most common return-to-competition criteria in the literature are completion of the ITP, completion of the mound program, and a minimum time from surgery.¹ Overall return to preinjury level averages 85.7% at a mean of 12.2 months after UCL reconstruction; final competitive clearance is given by Dr. Roth.¹

Setback Protocol

Setbacks are expected and manageable. The response depends on the type and timing of symptoms.⁸

- **Pain during throwing:** Stop immediately. Rest 2–3 days. Drop back two steps. If pain recurs at the reduced step, stop the program and re-evaluate clinically.
- **Soreness after throwing that resolves within 24 hours:** Acceptable. Repeat the same step before advancing.

- **Soreness persisting beyond 24 hours:** Rest until symptom-free, then drop back one step.
- **Mechanical breakdown** (loss of arm slot, decreased accuracy, compensatory patterns): do not advance. Address with mechanics work and plyometric re-conditioning before resuming.

Arm Care and Concurrent Training

Every throwing session is bracketed by arm care, and throwing is never the athlete's only training.^{3,17}

- **Pre-throwing:** dynamic warm-up; band work (rotator cuff ER/IR, scapular retraction); plyometric ball progression (two-hand overhead, chest pass, one-hand wall throws).
- **Post-throwing:** posterior shoulder stretching (sleeper stretch, cross-body stretch); ice if needed.
- **Concurrent training:** core strengthening, hip mobility (especially internal rotation), lower-extremity power (single-leg work), and scapular stabilization throughout the program.

References

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Glossary

ER / IR — External rotation / internal rotation (of the shoulder).

ITP — Interval throwing program; the structured, distance- and volume-graded throwing progression in this document.

Long toss — Progressive-distance flat-ground throwing on an arc, used to build arm strength and endurance.

MMT — Manual muscle testing.

Pull-down — Line-drive throws at shortened distance and higher effort, transitioning long-toss conditioning toward game mechanics.

Scapular dyskinesis — Abnormal scapular position or motion during arm movement, associated with shoulder and elbow overload.

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