



Throwing Injury Prevention Program

CV MINOR BALL, Invermere, BC

Why?

Arm injuries affect many youth baseball players; with proper mechanics and training many can be prevented. Understanding the basics of common throwing injuries, mechanisms and consequences is naturally motivating to the young athlete. It is up to us as an organization to educate ourselves and provide best teaching practices to our youth.

Prevent Injury.

Strain can cause injury when it reaches a cumulative threshold over time (chronic, repetitive strain) or when it exceeds a critical threshold in a particular moment (acute). Both are at play in throwing injuries.

The most common throwing injuries are shoulder and elbow. Shoulder injuries typically involve the rotator cuff muscles, commonly at their attachments to the bony skeleton.

Elbow injuries are most commonly ligamentous, and typically affect the ulnar collateral ligament (UCL). The surgery to repair a torn UCL is called the Tommy John. Anyone that watches the majors has heard this referenced. It's an 18-month recovery and rehabilitation, and very often a 'never the same since' moment in a pitcher's career.

While most youth athletes are not experiencing forces sufficient to rupture the UCL, they do experience chronic strain that affects them during the growing years which can cause degenerative changes and injury. Pitch count restrictions have reduced shoulder injuries overall, but elbow injuries require more attention to whole body mechanics.





Throwing Mechanics

To reduce throwing injury, we need to appreciate mechanics with a whole kinetic chain perspective.

For example, limited range of motion of the hip on the stride leg significantly increases the risk of a UCL injury.

The shoulder and elbow together generate tremendous torque to deliver the ball in a pitch, but much of the power comes from the legs. The potential for the kinetic power comes from the wind up, and the energy from the legs and core in acceleration. At the point of delivery, there is considerable momentum that needs to be absorbed by the body. Critical in this kinetic chain for injury prevention is the internal rotation of the landing leg (opposite to throwing arm). If this range of motion is not available, it increases the strain on delivery of the UCL – and leads to chronic strain or acute rupture.

Reducing injury also requires balanced strength with full range of motion. Hence a training program that strengthens all elements of the throwing mechanic, and also whole- body functional movements to promote smooth and free transfer of force through the system. Power comes from the muscles of the lower body and core in combination with the coiling of rotation and separation, delivered through the shoulder and elbow, nuanced by grip, spin and axes.

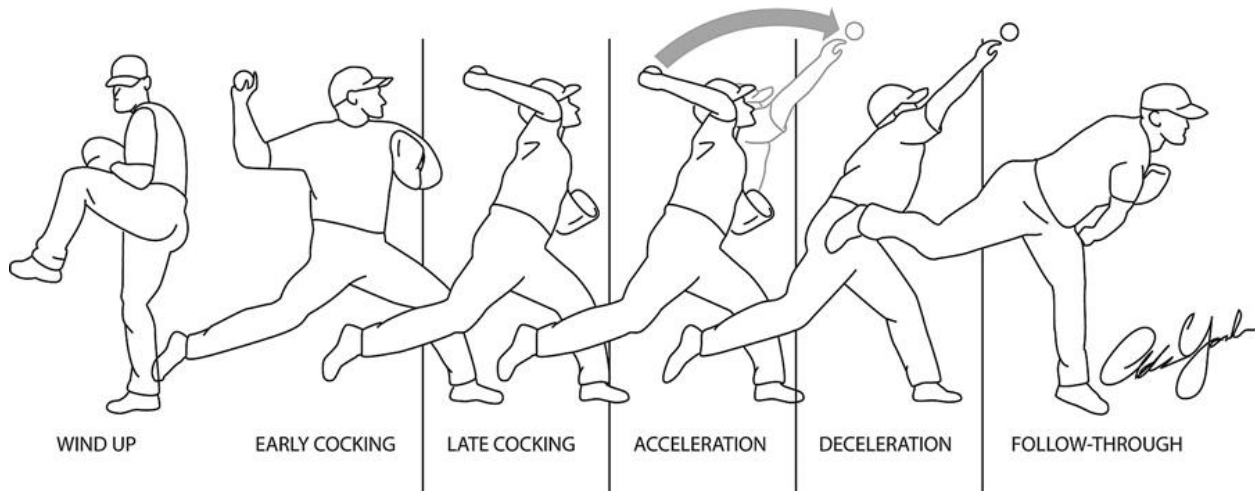
The power in pitching is generated by muscles but transmitted by the elasticity of the fascia or connective tissue. Ligaments are a chain in the connective tissue, where concentrated forces accumulate at attachments with bones.

The elasticity of this tissue is the critical element. Training it for efficiency and resilience is fundamentally different than building muscle. Whole body movements (long chain) and dynamic stretching are key ways to care for this system. Static stretching before an activity reduces power by up to 40%. Diet and hydration are also critical but are a topic on their own.



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Phase	Notable active musculature	Potential concerns	Warm-up exercises
Windup	Iliopsoas, rectus femoris, pectineus, sartorius, tensor fascia latae, gluteus medius, gluteus minimus, core	Center of gravity, ankle dorsiflexion, lumbopelvic control	Ankle box stretch, lateral monster walk, forward lunge, lateral lunge, bird dog
Stride	Tensor fascia latae, gluteus medius, gluteus minimus, core	Lumbar hypermobility, Thoracic hypomobility	Pallof press, lift, chop, thoracic spine extension mobilization, thoracic spine rotation mobilization
Cocking	Deltoid, rotator cuff, levator scapulae, serratus anterior, trapezius, rhomboid, pectoralis minor	Scapular dyskinesis, glenohumeral capsular laxity	Low row, inferior glide, lawn mower, robber
Acceleration	Latissimus dorsi, pectoralis, rotator cuff, trapezius, serratus anterior, levator scapulae, biceps brachii	Glenohumeral internal rotation deficit	Sleeper stretch, cross body stretch, overhead triceps stretch
Deceleration	Teres minor, infraspinatus, posterior deltoid, biceps brachii, brachialis, trapezius, rhomboid, serratus anterior	Glenohumeral internal rotation deficit, subacromial impingement, biceps brachii tendinitis, posterior rotator cuff tendinitis, posterior capsule tightening	Reverse throw
Follow-through	Culmination of kinetic chain delivering the pitch. Low risk of injury during this phase		



WE WARM UP TO THROW, WE DON'T THROW TO WARM UP. BODIES BEFORE ARMS.

Pre-throwing:

- global dynamic (high knees, butt kicks, hamstring kicks, arms open, side skips, leg crossovers, etc.)
- dynamic stretching before an activity primes the muscles and the fascia to be responsive and activated.
- Static stretching before an activity reduces power by up to 40%
- rotators/upper body specific recruitment
 - o prone specific recruitment (yokohama)
 - o blood flow + priming (jband)
 - o Tom House warm up

Throwing Program

- See Throwing Card for program details
- Progression is key – start small, build slowly
- Long Toss – begin short, work long over time; progression is key
- Keep elbow high and above shoulder when throwing
- Distance according to age and ability, partner long toss with equal development
- Partners
 - o One Knee Flick Drill (wrist, elbow)
 - o One Knee Isolate Upper Body
 - o Throwing loaded position (body, arms, hands, ball pointed away)
 - o Rock & Fire
 - o Jump Backs + Back to Target
 - o Two Shuffle throw
 - o Long Toss
- Group
 - o Box Drill
 - Forward & Reverse (footwork)



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Bullpens

- Start small (20 pitches), build steadily
- Coaches + Players need to be accountable for pitch counts on weekends and weekdays play, ensuring enough rest is included

Post – Pitching

- 24-48 hours
 - o Priority is blood flow: movement + cardio
 - No ice!
 - o Low tension band work with a focus on posterior shoulder muscles

Pitch Counts (BC Minor Baseball)

When playing in tournaments in other provinces/leagues, be sure to review the regulations that apply.

9U (42')

Pitchers may only pitch one inning, with a maximum pitch count of 35 during spring season. Tournament play has exceptions – please see rule 31.04

11U (46')

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15U (54')

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Whole Kinetic Chain

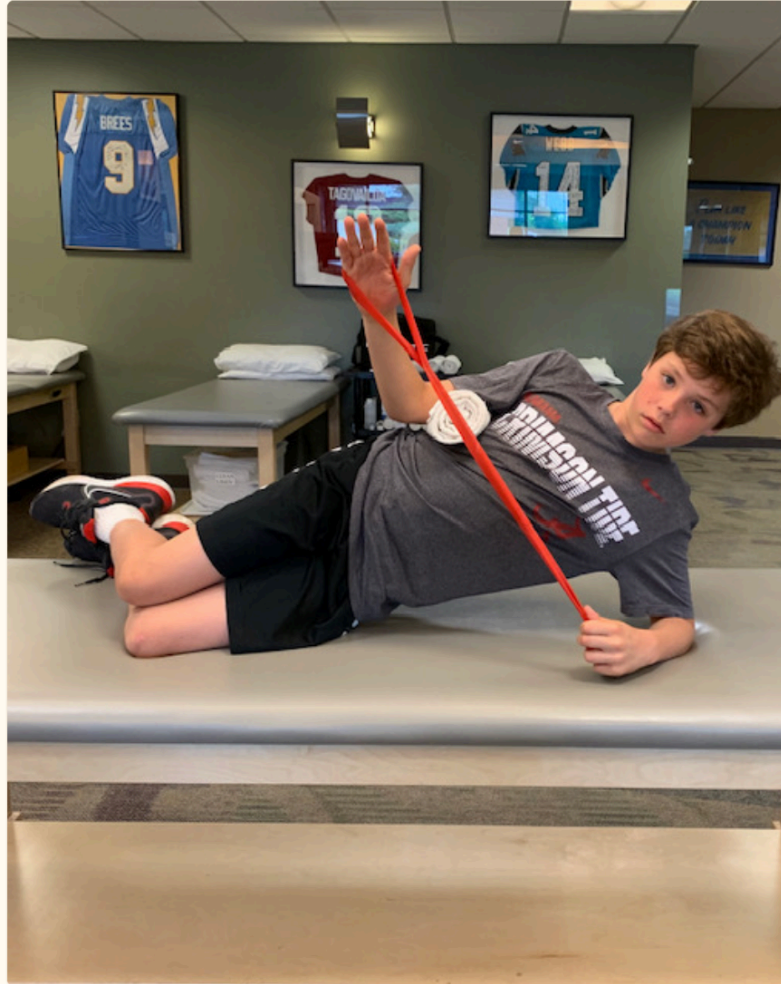


Figure 2. Sidelying external rotation strengthening being performed in a side plank position to recruit hips & core muscles.



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Figure 6. Lateral slides with a resistance band to provide resistance to the lateral hip musculature.



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Figure 4. Modified robbery exercise utilizing resistance bands in a partial squat position.



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Figure 3. Standing shoulder complex rowing using resistance bands while in a partial squat position to activate legs & hip muscles.



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Figure 5. Single leg squat to strengthen the leg but also lateral hip musculature.

Mayes, Salesky, Lansdown., Throwing Injury Prevention Strategies with a Whole Kinetic Chain-Focused Approach. Curr Rev Msk Med 15(2) 2022 April



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J- Band Program (Jaeger Sports)

DUAL ARM EXERCISES

1: Over-the-head Forearm Extensions

- **BE SURE** to place clip so it is not in alignment with head
- Get in lunge position with front knee over front heel at right angle.
- Elbows stay stationary
- Palms extend forward

Exercise 1
Step 1



Exercise 1
Step 2



2: Side Extensions

- **BE SURE** to place clip so it is not in alignment with head, & that there is lag in the J-Band
- Front knee over front heel at right angle
- Lengthen (not round) the side
- Extend from back hip through fingertips

Exercise 2
Step 1



Exercise 2
Step 2



3: Diagonal Extensions

- Clip at mid-back height
- Front knee over front heel at right angle
- Extend from back hip diagonally through fingertips

Exercise 3
Step 1



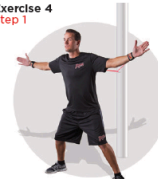
Exercise 3
Step 2



4: Forward Flies

- Clip at chest height
- Slightly bent elbows at chest height
- Bring palms toward each other

Exercise 4
Step 1



Exercise 4
Step 2



5: Reverse Flies

- Clip at mid-back height
- Same as Forward Flies in reverse direction
- Palms move away from each other
- Bend knees; keep chin over toes and head still

Exercise 5
Step 1



Exercise 5
Step 2



Workout Reminders

1. Exercises are to be done **PRIOR** to throwing (or on average of 3-5 days a week during periods of time off)
2. One set of 25 repetitions per exercise (Exercises 2 & 3 involve using the breath while stretching in 30 second increments)
3. Quality over Quantity
4. Maintain proper technique, alignment, etc
5. Keep pace fluid in both directions
6. Keep arm, body, and mind relaxed
7. Keep long, fluid breathing patterns
8. Walk closer to the fence to reduce tension
9. Work to the point of fatigue rather than failure.



Bat Arm Conditioning for Pitching

Table Pitcher's Baseball Bat Program			
	Exercise	Resistance	Volume
1	Overhead pronation-supination	6- to 14-year-olds: 1/2 bat	6- to 14-year-olds: 2 sets of 15
		15+ year olds: 1/2-3/4 bat	15+ year olds: 3 sets of 20
2	Neutral wrist radial bat circles	6- to 14-year-olds: 1/2 bat	2 sets of 20 clockwise circles
		15+ year olds: 1/2-3/4 bat	2 sets of 20 counterclockwise circles
3	Neutral wrist ulnar bat circles	6- to 14-year-olds: 1/2 bat	2 sets of 20 clockwise circles
		15+ year olds: 1/2-3/4 bat	2 sets of 20 counterclockwise circles
4	Radial bat deviations	6- to 14-year-olds: 1/2 bat	6- to 14-year-olds: 2 sets of 15
		15+ year olds: 1/2-3/4 bat	15+ year olds: 2 sets of 25
5	Ulnar bat deviations	6- to 14-year-olds: 1/2 bat	6- to 14-year-olds: 2 sets of 15
		15+ year olds: 1/2-3/4 bat	15+ year olds: 2 sets of 25
6	Resisted bat pronation at full supination	6- to 14-year-olds: 1/2 bat	6- to 14-year-olds: 1 set of 12
		15+ year olds: 1/2 bat	15+ year olds: 2 sets of 15
7	Neutral wrist eccentric pronation	6- to 14-year-olds: 1/2 bat	6- to 14-year-olds: 1 set of 10
		15+ year olds: 1/2 bat	15+ year olds: 2 sets of 10

Objective: improve muscular resistance to valgus stress by enhancing varus torque strength. Valgus stress causes medial elbow tendinopathy, UCL damage, lateral elbow compression, and posteromedial olecranon impingement.

Table
Pitcher's Baseball Bat Program
Source
Injury Prevention for Throwing Athletes Part I: Baseball Bat Training to Enhance Medial Elbow Dynamic Stability
Strength & Conditioning Journal34(2):79-85, April 2012.

Yokohoma 9

- Plank on forearms
- Prone extended arm work
- Prone ER/IR