



UNIVERSITY ORTHOPAEDIC CENTER, PA
RAPHAEL S. F. LONGOBARDI, MD, FAAOS

INTERVAL REHABILITATION PROGRAMS

INTERVAL THROWING PROGRAM FOR BASEBALL PLAYERS

The Interval Throwing Program (ITP) is designed to bring about a gradual return of motion, strength, and confidence to the throwing arm after injury or surgery by slowly progressing the athlete through graduated throwing distances. The ITP can be initiated after clearance by the athlete's physician for the resumption of throwing and is carried out under the supervision of the rehabilitation team (physician, athletic trainer, and/or physical therapist). The program is set up to minimize the chance of reinjury and emphasizes prethrowing warm-up and stretching. In the development of the Interval Throwing Program, the following factors are considered most important:

1. **The act of throwing a baseball involves the transfer of energy from the feet through the legs, pelvis, trunk, and out the shoulder through the elbow and hand. Therefore, any return to throwing after injury must include attention to the entire body.**
2. **The chance for reinjury is lessened by a graduated progression of interval throwing.**
3. **Proper warm-up is essential.**
4. **Most injuries occur as the result of fatigue.**
5. **Regard for proper throwing mechanics lessens the incidence of reinjury.**
6. **Baseline requirements for throwing include a pain-free range of motion of all joints involved in throwing and adequate muscle power and resistance to fatigue.**

Because there is an individual variability in all throwing athletes, there is no set timetable for completion of the ITP. Most athletes, by nature, are highly competitive individuals who wish to return to competition at the earliest possible time. Although this is a necessary characteristic in all athletes, the proper channeling of the athlete's energies into a rigidly controlled throwing program is essential to lessen the chance of reinjury during the rehabilitative period. The athlete may want to increase the intensity of the throwing program, but this can increase the incidence of reinjury and may greatly retard the rehabilitation process. It is recommended that the program be followed rigidly, because this represents the safest route for returning to competition.

During the recovery process the athlete may experience soreness and a dull, diffuse, aching sensation in the muscles and tendons. If the athlete experiences sharp pain, particularly in the joint, all throwing activity should be stopped until this pain abates. Throwing should also be discontinued if the athlete's elbow or shoulder becomes swollen. Heat on the shoulder or elbow may help loosen up the joint prior to throwing. Ice alone is recommended after throwing or to treat swelling.

Weight Training

The athlete should supplement the ITP with a high-repetition, low-weight exercise program. The strengthening regimen should maintain a proper balance between the anterior and posterior musculature so that the shoulder is not predisposed to injury. Special emphasis must be given to the posterior rotator cuff musculature in any strengthening program. Weight training does not increase throwing velocity but increases the resistance of the arm to fatigue and injury. If the athlete uses weight training, this should be done on alternate days, with throwing on days in between. Because weight lifting tends to tighten the joints, it must be stressed that weight training is of no benefit unless accompanied by a sound flexibility program.

Individual Variability

The ITP is designed so that each level is achieved without pain or complication before the next level is started. This sets up a progression—a goal is achieved prior to advancement instead of advancing according to a specific time frame. Thus, the ITP may be used for those with different levels of skills and abilities, from athletes in high school to professionals. The reasons for performing the ITP vary from person to person, so the length of time required to complete each step successfully also varies. For example, one athlete may wish to throw on alternate days, with or without using weights in between, and another athlete may have to throw every third or fourth day because of pain or swelling. “Listen to your body—it will tell you when to slow down.” Again, completion of the ITP steps is subject to individual variation. There is no fixed timetable in terms of days to completion.

Warm-Up

Jogging increases blood flow to the muscles and joints, thus increasing their flexibility and decreasing the chance for injury. Because the length of the warm-up varies among individuals, the athletes should jog until a light sweat develops and then progress to the stretching phase.

Stretching

Throwing involves all muscles in the body. So all muscle groups should be stretched prior to throwing. This should be done in a systematic fashion, beginning with the legs and including the trunk, back, neck and arms.

Throwing Mechanics

A critical aspect of the ITP is maintenance of proper throwing mechanics throughout its advancement. The use of the crow-hop method stimulates the throwing act allowing emphasis on proper body mechanics. This method should be adopted from the onset of the ITP. Throwing flatfooted encourages improper body mechanics, placing increased stress on the throwing arm and thus predisposing the arm to reinjury. The pitching coach and sports biomechanist (if available) may be valuable allies to the rehabilitation team because of their knowledge of throwing mechanics.

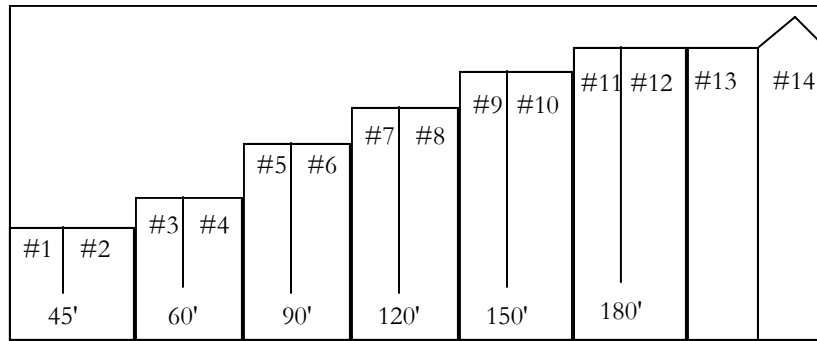


Fig B-1 Calculation of the Interval Throwing Program

The crow-hop method begins with a hop, then a skip, and followed by the throw. The velocity of the throw is determined by the distance—that is, the ball should have only enough momentum to travel the designated distance. Again, emphasis should be placed on proper throwing mechanics when the athlete returns to throwing off the mound or to his or her respective position to decrease the chance of reinjury.

Throwing

Using the crow-hop method, the athlete should begin warm-up throws at a comfortable distance (approximately 30 to 45 feet; Part 1 of the ITP) and then progress to the distance indicated for that phase (see Fig B-1). The object of each phase is for the athlete to be able to throw the ball the specified number of feet (45, 60, 90, 120, 150, or 180), without pain, 75 times at each distance. Athletes who can throw the ball 180 feet, 50 times, without pain, are ready for Part II of the ITP, throwing off the mound or returning to their respective position (step 14). At this point, full strength and confidence should be restored in the athlete’s arm. It is important to stress the crow-hop method and proper mechanics with each throw. Just as advancement to this point has been gradual and progressive, the return to unrestricted throwing must follow the same principles. A pitcher should first throw only fast balls at 50%, progressing to 75% and finally to 100%. At this time the athlete may begin to throw more stressful pitches, such as breaking balls. The position player should simulate a game situation, again progressing from 50 to 70 to 100%.

Once again, if an athlete has increased pain, particularly at the joint, the intensity of the ITP should be reduced. Readvancement should be under the direction of the rehabilitation team members.

Batting

Depending on the type of injury, the time of return to batting should be determined by the physician. Stress placed on the arm and shoulder during the batting motion is very different from that during the throwing motion. Return to unrestricted use of a bat should also follow the same progressive guidelines as those for the throwing program.

Therefore, by using the Interval Throwing Program in conjunction with a structured rehabilitation program, the athlete should be able to return to a full competition status, minimizing the chance of reinjury. The program and its progression should be modified to meet the specific needs of each individual athlete. A comprehensive program consisting of a maintenance strength and flexibility regimen, appropriate warm-up and cool-down procedures, proper pitching mechanics, and progressive throwing and batting will assist the baseball player in returning to competition safely.

PART I: WARM-UP THROWS

45' Phase

- Step 1:** (A) Warm-up throwing
 (B) 45' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 45' (25 throws)

- Step 2:** (A) Warm-up throwing
 (B) 45' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 45' (25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 45' (25 throws)

60' Phase

- Step 3:** (A) Warm-up throwing
 (B) 60' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 60' (25 throws)

- Step 4:** (A) Warm-up throwing
 (B) 60' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 60' (25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 60' (25 throws)

90' Phase

- Step 5:** (A) Warm-up throwing
 (B) 90' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 90' (25 throws)

- Step 6:** (A) Warm-up throwing
 (B) 90' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 90' (25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 90' (25 throws)

120' Phase

- Step 7:** (A) Warm-up throwing
 (B) 120' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 120' (25 throws)

- Step 8:** (A) Warm-up throwing
 (B) 120' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 120' (25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 120' (25 throws)

150' Phase

- Step 9:** (A) Warm-up throwing
 (B) 150' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 150' (25 throws)

- Step 10:** (A) Warm-up throwing
 (B) 150' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 150' (25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 150' (25 throws)

180' Phase

- Step 11:** (A) Warm-up throwing
 (B) 180' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 180' (25 throws)

- Step 12:** (A) Warm-up throwing
 (B) 180' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 180' (25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 180' (25 throws)

- Step 13:** (A) Warm-up throwing
(B) 180' (25 throws)
(C) Rest 10 minutes
(D) Warm-up throwing
(E) 180' (25 throws)
(F) Rest 10 minutes
(G) Warm-up throwing
(H) 180' (50 throws)

- Step 14:** Begin ITP off the mound or return to respective position

PART II: STARTING OFF THE MOUND

All throwing off the mound should be done in the presence of the pitching coach to stress proper throwing mechanics. A speed gun can be used to aid in effort control.

Stage One: Fastball Only

- Step 1:** (A) Interval throwing
(B) 15 throws off mound, 50%
- Step 2:** (A) Interval throwing
(B) 30 throws off mound, 50%
- Step 3:** (A) Interval throwing
(B) 45 throws off mound, 50%
- Step 4:** (A) Interval throwing
(B) 60 throws off mound, 50%
- Step 5:** (A) Interval throwing
(B) 30 throws off mound, 50%
- Step 6:** (A) 30 throws off mound, 75%
(B) 45 throws off mound, 50%
- Step 7:** (A) 45 throws off mound, 75%
(B) 15 throws off mound, 50%
- Step 8:** 60 throws off mound, 75%

Stage Two: Fastball Only

- Step 9:** (A) 45 throws off mound, 75%
(B) 15 throws in batting practice
- Step 10:** (A) 45 throws off mound, 75%
(B) 30 throws in batting practice

- Step 11:** (A) 45 throws off mound, 75%
(B) 45 throws in batting practice

Stage Three

- Step 12:** (A) 30 throws off mound,
75% warm up
(B) 15 throws off mound, 50%
breaking balls
(C) 45 to 60 throws in batting practice
(fast ball only)
- Step 13:** (A) 30 throws off mound, 75%
(B) 30 breaking balls, 75%
(C) 30 throws in batting practice
- Step 14:** (A) 30 throws off mound, 75%
(B) 60 to 90 throws in batting practice,
25% breaking balls
- Step 15:** (A) Simulated game — progressing by
15 throws per workout

LITTLE LEAGUER INTERVAL TRAINING PROGRAM

The Little League Interval Throwing Program parallels the Interval Throwing Program in returning the Little Leaguer to a graduated progression of throwing distances. Warm-up and stretching should be performed prior to throwing.

30' Phase

- Step 1:** (A) Warm-up throwing
 (B) 30' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 30'(25 throws)

- Step 2:** (A) Warm-up throwing
 (B) 30' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 30'(25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 30' (25 throws)

45' Phase

- Step 3:** (A) Warm-up throwing
 (B) 45' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 45' (25 throws)

- Step 4:** (A) Warm-up throwing
 (B) 45' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 45' (25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 45' (25 throws)

60' Phase

- Step 5:** (A) Warm-up throwing
 (B) 60' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 60' (25 throws)

- Step 6:** (A) Warm-up throwing
 (B) 60' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 60' (25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 60' (25 throws)

90' Phase

- Step 7:** (A) Warm-up throwing
 (B) 90' (25 throws)
 (C) Rest 15 minutes
 (D) Warm-up throwing
 (E) 90' (25 throws)

- Step 8:** (A) Warm-up throwing
 (B) 90' (25 throws)
 (C) Rest 10 minutes
 (D) Warm-up throwing
 (E) 90' (25 throws)
 (F) Rest 10 minutes
 (G) Warm-up throwing
 (H) 90' (25 throws)