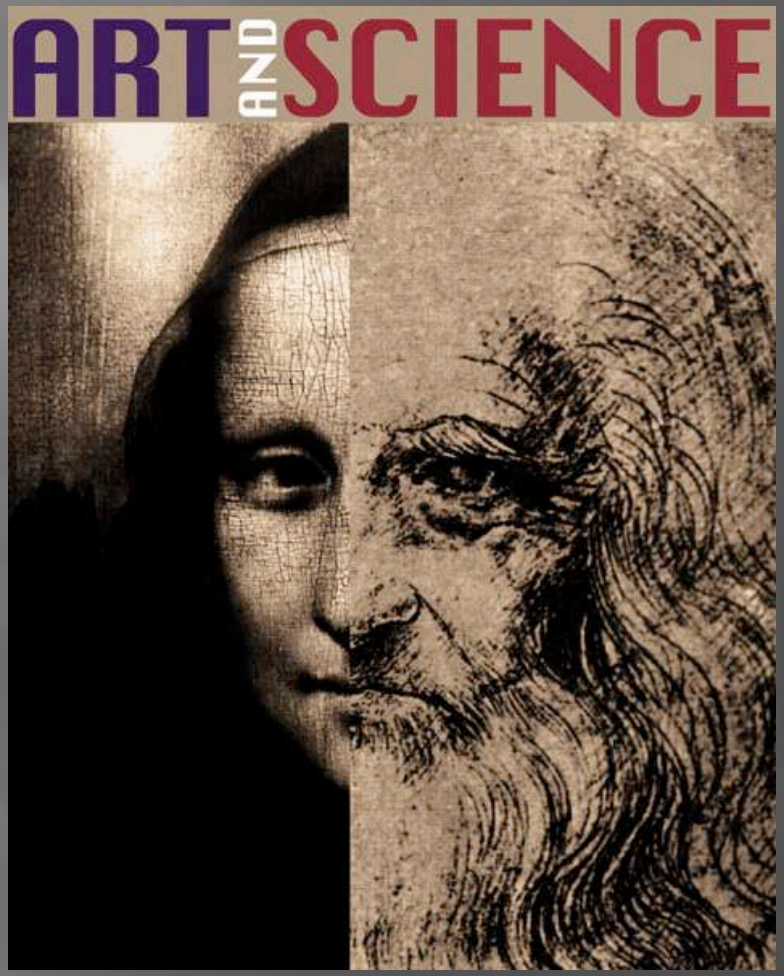
LATE PHASE REHABILITATION AND INTERVAL THROWING PROGRAM (13-17 WEEKS+) AFTER LABRAL INJURY/SURGERY IN THE THROWING ATHLETE

Mark Vinson, MEd, ATC, CSCS

The



# of Sports Medicine

Late Phase Rehabilitation

- Rehabilitation is about progression
  - Double arm- Single Arm
  - Slow tempo- Fast tempo
  - Light resistance- heavy
  - Stable- unstable

Late Phase Rehabilitation

- Rehab plan is designed to progressively load the tissues in a manner consistent with the demands of the sport/position
- SAID principle
- Position player vs Pitcher
  - Infielder/Outfielder/Catcher
  - Starting pitcher vs reliever

Late Phase Rehabilitation

- **13 weeks post-op**
- Initiate 2 handed plyometric program
  - Plyometric program is designed to slowly apply stresses to the upper body in a ballistic fashion
  - Added to current rehab exercises, typically done before

Late Phase Rehabilitation

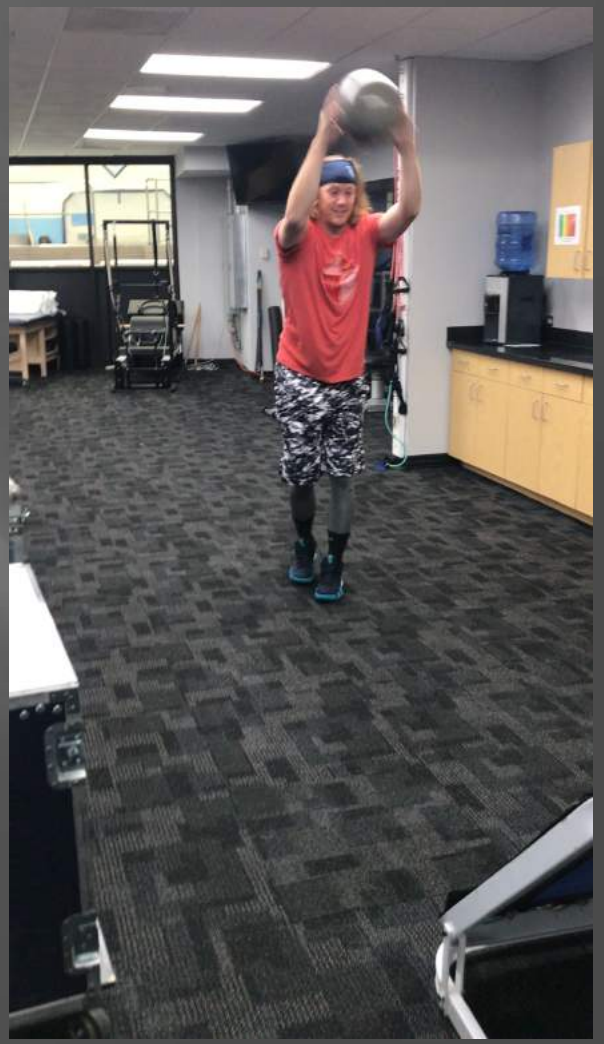
- **13 weeks post-op**
- Initiate 2 handed plyometric program
  - Medicine ball 6-8 lbs
  - 12-15 reps for each exercise
  - These exercises eventually become a warm-up prior to throwing when we initiate throwing program

Late Phase Rehabilitation

- 2-handed plyometric program
  - Chest pass

Late Phase Rehabilitation

- 2 handed plyometric program
  - Overhead pass

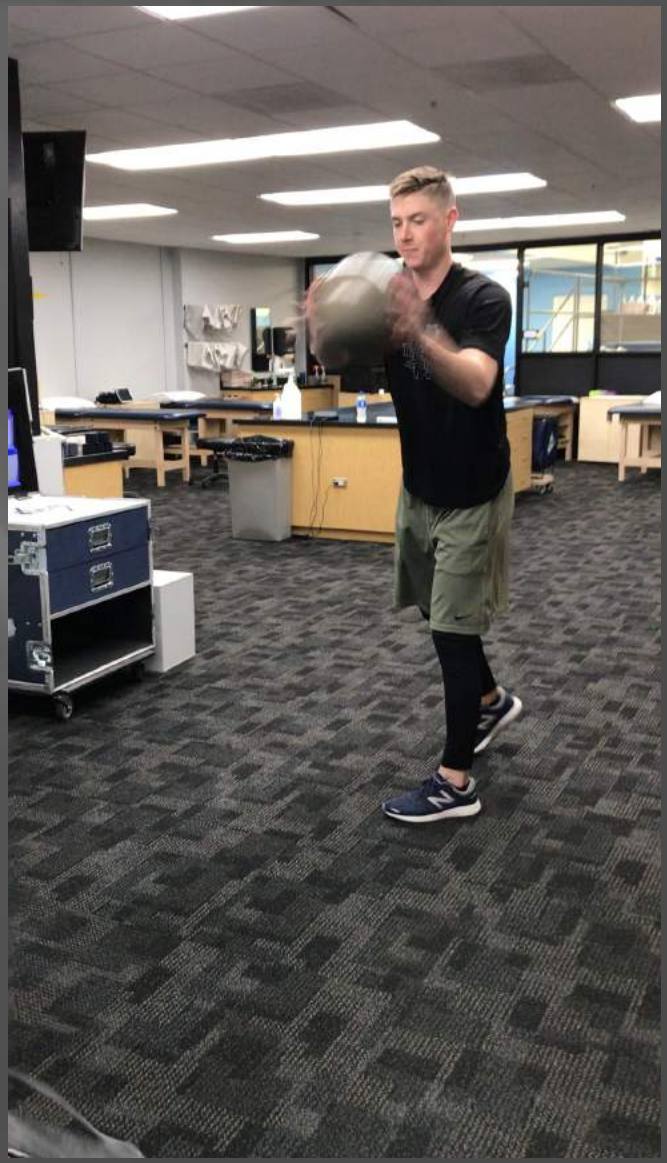


Late Phase Rehabilitation

- 2 handed plyometric program
  - Diagonal – Alternating sides

Late Phase Rehabilitation

- 2 handed plyometric program
  - Up and over each side



Late Phase Rehabilitation

- **14 weeks post-op**
- Add 1 handed plyometrics in addition to 2 handed plyometrics
  - IR at neutral

Late Phase Rehabilitation

- 1 handed plyometrics in addition to 2 handed plyometrics
  - ER at neutral

Late Phase Rehabilitation

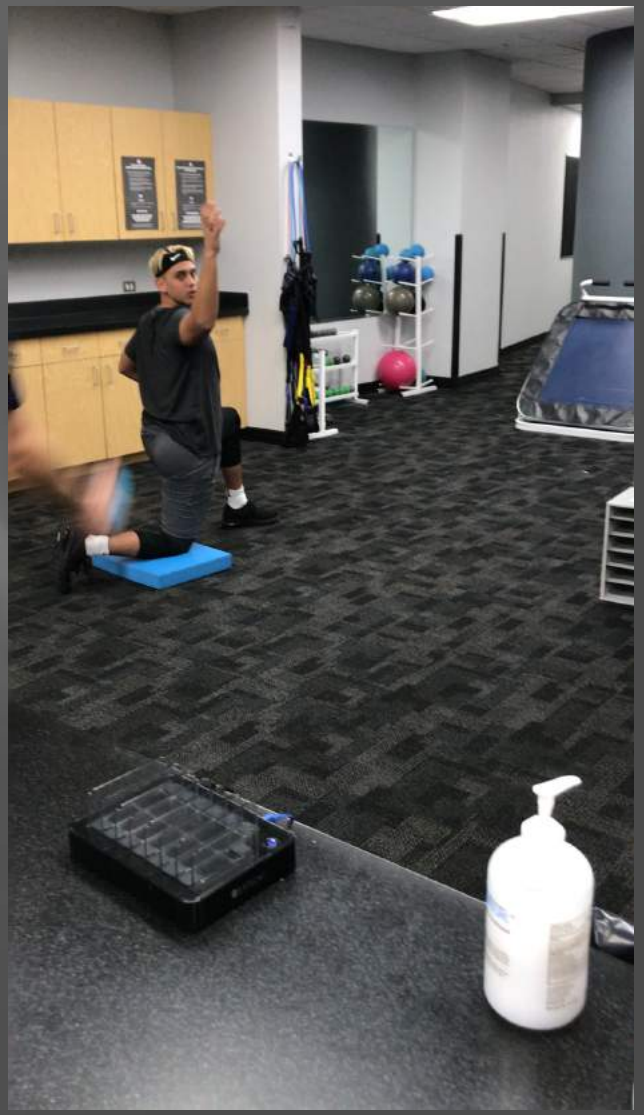
- 1 handed plyometrics in addition to 2 handed plyometrics
  - ER/IR at 90 degrees of abduction

Late Phase Rehabilitation

- 1 handed plyometrics in addition to 2 handed plyometrics
  - Prone ER at 90/90

Late Phase Rehabilitation

- 1 handed plyometrics in addition to 2 handed plyometrics
  - Reverse catch and throw



Late Phase Rehabilitation

- 16 weeks post-op
  - Initiate throwing program
  - Begin with sock throws prior to flat ground throwing
  - Typically done for 1 week prior to throwing to a partner

Research regarding interval throwing programs

- Various programs have been discussed and published in literature.
  - MJ Axe, et. al. *Sports Med and Artho Review.* 2001
  - MJ Axe, et. al. *Sports Health*. 2009
  - MM Reinhold, et. al. *J Orthop Sports Phys Ther.* 2002
- Most popular programs include similar guidelines.
- Many variables to consider if a study were to look at different throwing programs and long-term outcomes

Research

Guidelines included in literature

- Incremental increases in distance every 15 or 30 feet
- Throwing on an every other day basis to allow for recovery
  - We are performing rehab exercises on days that they throw
- Flat ground throwing prior to mound throwing
- Progression allowed only if pain-free
- Differences in programs based on age, skill level and position
- Emphasis on good mechanics

Research

Variations in Literature

- Progression
  - Number of throws at a given distance
  - Distance to throw on flat ground prior to advancing to mound progression
    - 120 feet or beyond???
  - Mound progression programs and effort level of throwing
    - How do you measure intensity?
      - Use of radar gun

Beginning an Interval Throwing Following Surgery

Program Guidelines

- Length of non-throwing rehab and throwing program itself is dependent on the amount of trauma to joints/tissues.
  - SLAP repair vs subacromial decompression/debridement

Beginning an Interval Throwing Following Surgery

Program Guidelines

- Ideally, we want to initiate throwing only after musculoskeletal trauma has healed AND appropriate strength is restored.
  - Preseason measures
- All programs are written in pencil—with a 10lb eraser!

Beginning an Interval Throwing Following Surgery

- Milestone for the athlete
  - Limited audience
  - 45 feet
  - No bullets, all about feel and regaining confidence

Flat ground interval throwing program

- Prefer counting number of throws at incremental levels
- Counting throws at each level gives us a good measure of total volume.
- Measure total volume (at 15 foot intervals)
  - Example:
    - 10 throws at 60’
    - 10 throws at 75’
    - 15 throws at 90’
    - 10 throws at 60’

Flat ground interval throwing program

- Total Volume → Fatigue → Injury
- Total Volume= Reps x Intensity

  (intensity = distance of throw)

Flat ground interval throwing program

PROGRAM 1

Interval Throwing Program for Baseball Players: Phase I

45' Phase

Step 1:
A) Warm-up Throwing
B) 45' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 45' (25 Throws)

Step 2:
A) Warm-up Throwing
B) 45' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 45' (25 Throws)
F) Rest 5-10 min.
G) Warm-up Throwing
H) 45' (25 Throws)

60' Phase

Step 3:
A) Warm-up Throwing
B) 60'(25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 60' (25Throws)

Step 4:
A) Warm-up Throwing
B) 60' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 60' (25 Throws)
F) Rest 5-10 min.
G) Warm-up Throwing
H) 60' (25 Throws)

90' Phase

Step 5:
A) Warm-up Throwing
B) 90' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 90' (25 Throws)

Step 6:
A) Warm-up Throwing
B) 90' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 90' (25 Throws)
F) Rest 5-10 min.
G) Warm-up Throwing
H) 90' (25 Throws)

120' Phase

Step 7:
A) Warm-up Throwing
B) 120' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 120' (25 Throws)

Step 8:
A) Warm-up Throwing
B) 120' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 120' (25 Throws)
F) Rest 5-10 min.
G) Warm-up throwing
H) 120' (25 Throws)

150' Phase

Step 9:
A) Warm-up Throwing
B) 150' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 150' (25 Throws)

Step 10:
A) Warm-up Throwing
B) 150' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 150' (25 Throws)
F) Rest 5-10 min.
G) Warm-up Throwing
H) 150' (25 Throws)

180' Phase

Step 11:
A) Warm-up Throwing
B) 180' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 180' (25 Throws)

Step 12:
A) Warm-up Throwing
B) 180' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 180' (25 Throws)
F) Rest 5-10 min.
G) Warm-up Throwing
H) 180' (25 Throws)

Step 13:
A) Warm-up Throwing
B) 180' (25 Throws)
C) Rest 5-10 min.
D) Warm-up Throwing
E) 180' (25 Throws)
F) Rest 5-10 min.
G) Warm-up Throwing
H) 180' (20 Throws)
I) Rest 5-10 min.
J) Warm-up Throwing
K) 15 throws progressing from 120 → 90'

Step 14: Return to respective position or progress to step 14 below.

All throws should be on an arc with a crow-hop

Warm-up throws consist of 10-20 throws at approximately 30 feet

Throwing Program should be performed every other day, 3 times per week unless otherwise specified by your physician or rehabilitation specialist.

Perform each step _____ times before progressing to next step.

Flat Ground Throwing for Baseball Pitchers

Step 14:
A) Warm-up Throwing
B) Throw 60 ft. (10-15 throws)
C) Throw 90 ft. (10 throws)
D) Throw 120 ft. (10 throws)
E) Throw 60 ft. (flat ground) using pitching mechanics (20-30 throws)

Step 15:
A) Warm-up Throwing
B) Throw 60 ft. (10-15 throws)
C) Throw 90 ft. (10 throws)
D) Throw 120 ft. (10 throws)
E) Throw 60 ft. (flat ground) using pitching mechanics (20-30 throws)
F) Throw 60-90 ft. (10-15 throws)
G) Throw 60 ft. (flat ground) using pitching mechanics (20 throws)

Progress to Phase II – Throwing Off the Mound

Flat ground interval throwing program

- Total Volume= Reps x Intensity

  (intensity = distance of throw)

PROGRAM 1

For Example:

Common throwing program in literature

2 sets x 25 @ 90 feet=4500

3 sets x 25 @ 90 feet=6750

Flat ground interval throwing program

P R O G R A M 2

60ft Phase (Week 1-2)		**Week 1**	**Week 1**	**Week 1**	**Week 2**	**Week 2**	**Week 2**
	45ft	30	30	25	25	25	25
	60ft	20	20	20	25	25	25
	45 ft			10	15	15	15
75ft Phase (Week 3-4)		**Week 3**	**Week 3**	**Week 3**	**Week 4**	**Week 4**	**Week 4**
	45ft	15	15	15	15	15	15
	60ft	25	25	25	25	25	25
	75ft	15	20	25	30	30	30
	45ft	10	10	10	10	10	10
90ft Phase (Week 5-6)		**Week 5**	**Week 5**	**Week 5**	**Week 6**	**Week 6**	**Week 6**
	45ft	10	10	10	10	10	10
	60ft	15	15	15	15	15	15
	75ft	25	20	20	15	25	25
	90ft	15	20	25	25	25	25
	60ft	10	10	20	20	20	20
105ft Phase (Week 7-8)		**Week 7**	**Week 7**	**Week 7**	**Week 8**	**Week 8**	**Week 8**
	45ft	10	10	10	10	10	10
	60ft	15	15	15	15	15	15
	75ft	15	15	15	15	15	15
	90ft	15	15	15	15	15	15
	105ft	10	15	20	20	20	25
	60ft	20	20	15	15	15	10
120ft Phase	***** Begin easy catch on alternate days***						
		Week 9	**Week 9**	**Week 9**	**Week 9**	**Week 9**	**Week 9**
(Week 9)	45ft	10	10	O	10	10	O
	60ft	10	10	F	10	10	F
	75ft	10	20	F	10	20	F
	90ft	10			10		
	105ft	10		D	10		D
	120ft	10		A	15		A
	60ft Flat	20	10	Y	15	15	Y

Flat ground interval throwing program

PROGRAM 2

- 90’ phase
- Step 1
  - 10 throws at 45’=450
  - 15 throws at 60’=900
  - 15 throws at 75’=1125
  - 10 throws at 90’=900
  - 10 throws at 60’=600

  Total=3975

- 90’ phase
- Step 2
  - 10 throws at 45’=450
  - 15 throws at 60’=900
  - 15 throws at 75’=1125
  - 15 throws at 90’=1350
  - 10 throws at 60’=600

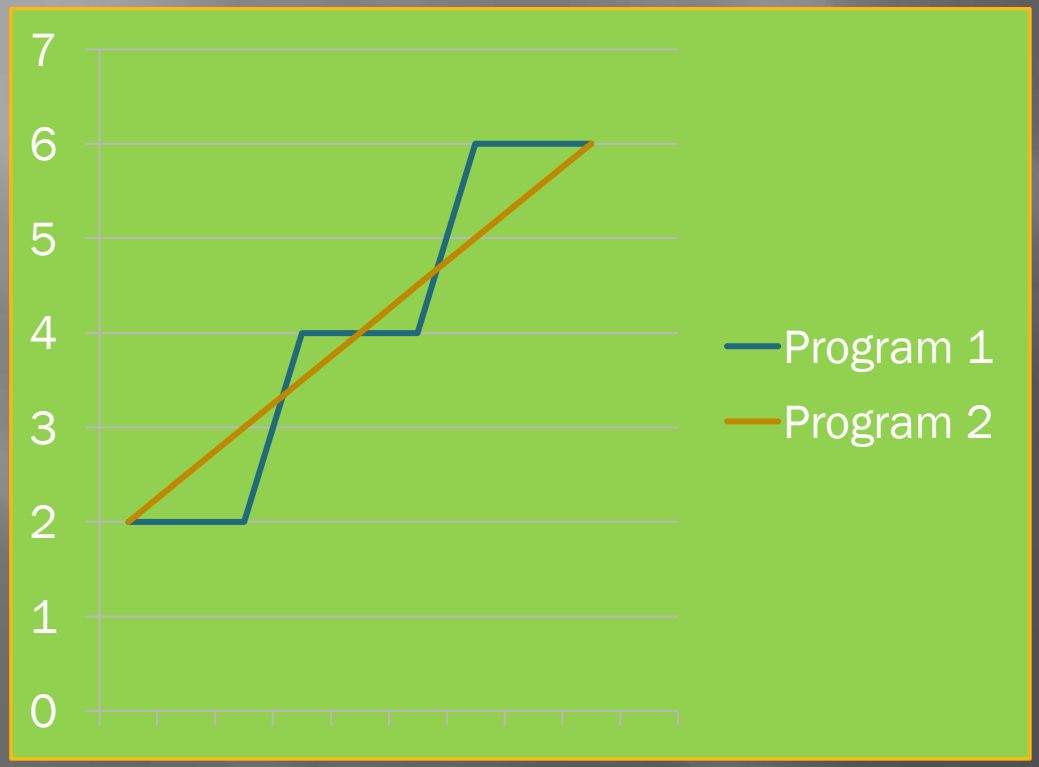
  Total=4425

Allows for gradual progression in volume from step to step within the program

Flat ground interval throwing program
Total volume = Reps x Distance

- Example: **PROGRAM 1**
- 3 sets x 25 throws at 120’
  - 75 throws at 120’= 9000

(this does not include throws up to 120’)



- Example: **PROGRAM 2**
- 120’ phase
  - 10 throws at 45’=450
  - 10 throws at 60’=600
  - 10 throws at 75’=750
  - 10 throws at 90’=900
  - 10 throws at 105’=1050
  - 10 throws at 120’=1200
  - 10 throws at 60’=600

Total=6075

Allows for gradual progression in volume from step to step within the program

Flat ground interval throwing program

- Total Volume → Fatigue → Injury
- Total Volume= Reps x Intensity

  (intensity = distance of throw)

Flat ground interval throwing program

- 3x week (M,W,F) until reach 120’
  - Once you reach 120’ start to increase frequency
    - Long toss Mon/Thurs
    - Add throwing at shorter distance on Tues/Friday/Sat
    - Off on Wed/Sun
    - Follow for approx. 2 weeks

Mound Progressions

- Approximately 7 mts post-op
  - Flat ground program takes approximately 3 mts.
- Start at 55 feet (catcher in front of the plate)
  - Allows for pitcher to get reacquainted with the slope of the mound at a shorter distance

Mound Progressions

- 2 sessions per week with at least 3 days off in between (Mon/Fri/Tues/Sat)
- Warm up throwing program on flat ground out to 120’ or more.
- 20 pitches fastball only

Mound Progressions

- Following week move back to regular distance, progress to 25 throws
- Fastball only

Mound Progressions Guidelines

- Maintain 2 mound sessions per week with throwing in-between
- Progress by 5 throws each time until reach 50 pitches for starter.

Mound Progressions Guidelines

- Reliever may only require 35-40 pitches depending on role.
- Instead of building up number of pitches, work to build stamina by decreasing recovery time between bullpen sessions. (ie. on 2 days rest instead of 3)

Mound Progressions Guidelines

- Total number of mound sessions may be increased based on pitching coach/pitcher feedback however typically a minimum of 16 bullpens before facing live hitters

Mound Progressions Guidelines

- Live Batting Practice
  - Live BP
  - Throwing to hitter with screen in front of pitcher. Like a bullpen session with hitters in batters box. Pitcher tells the hitter type of pitch being thrown.
  - Alternate LHH's and RHH's every 5 pitches
- Typically minimum of 2 Live BP's

Mound Progressions Guidelines

- Simulated Game
  - Similar to Live BP, but usually no L screen for pitcher.
  - Hitters do not know what type of pitch is being thrown.
  - Keep track of balls and strikes and change batters after a simulated at-bat (ie. contacted ball in fair play, walk or strikeout).

Mound Progressions Guidelines

- Simulated Game
  - Can end session in middle of an at-bat to complete desired number of pitches
  - For starters, can simulate a rest in between innings (for a 2 inning simulated outing).

Game Progressions Guidelines

- Starters use rule of 15 pitches/inning limit
  - Example: not to exceed
    - 2 innings or 30 pitches
    - 3 innings or 45 pitches
    - 4 innings or 60 pitches

Important to not skip steps

Game Progressions Guidelines

- Relievers typically will go 1 inning 25 pitch max for rehab outing
- May go 2 innings/35 pitch max
- May alter program to pitch back to back days at end stage of rehab program depending on role

Position Players

- Need to complete position specific program based on their position before return to games

Catchers need to complete program that involves throws to second base from a crouch (120’)

Position Players

- Need to complete position specific program based on their position before return to games

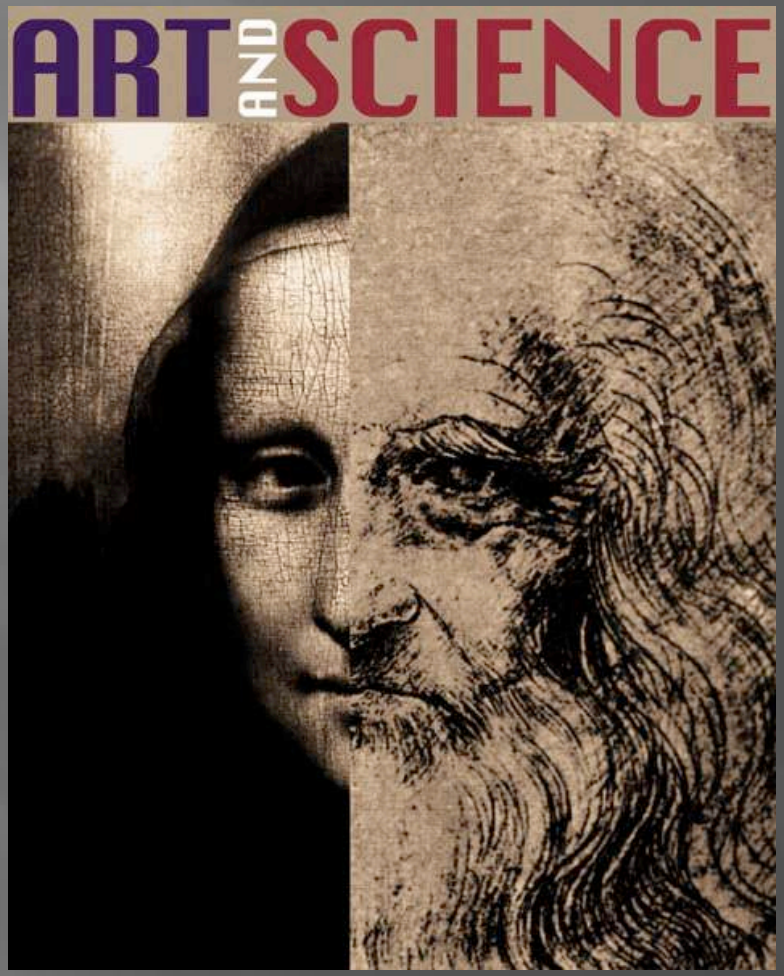
Infielders need to complete a program that involves variety of distances and arm angles

Position Players

- Need to complete position specific program based on their position before return to games

Outfielders need to complete a program that involves throws from various distances to third base and home plate (>120’)

The



# of Sports Medicine

Thank You

mvinson@raysbaseball.com

References

- Axe MJ, Hurd W, Snyder-Mackler L. Data-based interval throwing programs for baseball players. *Sports Health: A Multidisciplinary Approach.* 2009: 1(2) 145-153.
- Axe MJ. Konin JG. Distance based criteria interval throwing program. *J Sport Rehab* 1992; 1; 326-336.
- Axe MJ. Snyder-Mackler L, Konin JG, et al. Development of distance-based interval throwing program for the little league-aged athletes. *Am J Sports Med* 2006; 24(5):594-602.
- Axe MJ. Wickham R, Snyder-Mackler L. Data-based interval throwing programs for little league, high school, college, and professional baseball pitchers. *Sports Med Arthroscopy Rev* 2001; 9(1) 24-34.
- Chang, Edward & E Bishop, Meghan & Baker, Dylan & West, Robin. (2016). Interval Throwing and Hitting Programs in Baseball: Biomechanics and Rehabilitation. *American journal of orthopedics* (Belle Mead, N.J.). 45. 157-162.
- Fleisig GS, Bolt B, Fortenbaugh D, Wilk KE, Biomechanical Comparison of Baseball Pitching and Long-Toss: Implications for Training and Rehabilitation. *J Orthop Sports Phys Ther.* 2011: 41(5) 296-303.
- Fleisig GS, Zheng N, Barrentine SW, Escamilla RF, Andrews JR, Lemak LJ. Kinematic and kinetic comparison of full and partial effort baseball pitching. In: Conference Proceedings of the 20th Annual Meeting. Atlanta, GA: American Society of Biomechanics; 1996:151-152
- Reinhold MM, Wilk KE, Reed J, Crenshaw K, Andrews JW. Interval sport programs: Guidelines for baseball, tennis and golf. *J Orthop Sports Phys Ther.* 2002: 32(6) 293-298.
- Scher, S. Throwing Programs. In: Karageanes, SJ. *Principles of manual sports medicine.* Philadelphia: Lippincott Williams & Wilkins. 2005:108-114.
- Wilk KE, Arrigo CA. Interval sports programs for the shoulder. In: Andrews JR. Wilk KE (eds), *The Athlete's Shoulder*. New York: Churchill Livingstone. 1994: 669-678..
- Wilk KE, Meister K, Andrews JW. Current concepts in the rehabilitation of the overhead throwing athlete. *Am J Sports Med* 2002:30(1):135-151