

# Training the pitcher: a hypothetical model

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The major determinant of success in baseball pitching is arguably a combination of skill, knowledge, psychological outlook and physical conditioning. The lack of even one of these attributes places the pitcher at a severe disadvantage during competition. Coaches spend a considerable amount of practice time in an effort to place the athlete in a position to perform at an optimal level. Most of the emphasis during practice is placed on skill development, motivation and the acquisition of knowledge of the sport. Consequently, less time is spent developing a proper conditioning program for individual athletes. Coaches of team-oriented sports often group their athletes together for conditioning programs. Although this may be an acceptable method for generalized conditioning, it does not address the specific needs of each player, especially the pitcher. Pitchers have thus turned to various modes of self-designed training in an effort to improve performance. Star baseball pitchers like Steve Carlton, Frank Tanana and Nolan Ryan have engaged different conditioning methods to continue to perform at their high ability levels (2). This article will attempt to outline an off-season and in-season strength and conditioning

program specifically designed for baseball pitchers.

### Basis for Development

The theoretical physiological evidence tends to support the belief that baseball is an anaerobic power sport in terms of strength and energy production. This implies that the repetitive activities involved in a baseball game are of short duration and maximum intensity, requiring rapid energy production. It has been suggested that the shorter the performance time of an activity, the greater the power output required and subsequently the more rapid the energy reproduction must be (1). Pitching is no exception to this premise. Pitching can be described as a series of short duration and maximal intensity efforts.

When attempting to develop a strength and conditioning program for pitchers, one must first identify the fitness components that are involved within the activity. Pate, McClenaghan and Rotella (3) suggest that the importance of the various fitness components for baseball are as follows: **extremely important:** muscular strength and anaerobic power; **moderately important:** muscular endurance, cardiovascular endurance, flexibility and body composition; **not**

**important:** anaerobic capacity.

The proposed program outlined here places emphasis on off-season development and in-season maintenance of muscular strength and anaerobic power. This hypothetical program is specifically designed to maximize a pitcher's strength and power for the beginning of the competitive season and then maintain these attributes without any appreciable loss of either component.

### Strength and Power Development

Strength training was at one time considered inappropriate for athletes involved in highly skilled activities. It is now recognized that strength training is essential for successful competition in baseball (5). While absolute strength is a necessary component of performance, power may be an even more important component for pitching success. Strength and power development are very closely related. An increase in power is the result of improvements in either strength or speed or both (5). Therefore, an increase in muscular strength also will result in an increase in power output. Weightlifting has been shown to significantly increase muscle strength and speed of movement as well. These improvements in strength and

**Table 1. Strength Training Exercises for Power Development.**

Lower Body	Upper Body
Squats	Incline bench press
Leg extensions	Upright rowing
Leg curls	Bent arm pullovers
Calf extensions	Tricep extensions
Lunges	Trunk extensions
Straight leg deadlift	Weighted sit-ups

Supplemental exercises for strengthening the wrist and forearm muscles may also be incorporated into the workout.

speed often lead to an increase in power. **Table 1** lists specific strength training exercises that should benefit power development of pitchers.

The selection of these exercises is based on the belief that most multi-joint, large muscle mass exercises will develop strength/power and allow for the development and maintenance of flexibility, cardiovascular fitness and body composition, better than uni-joint, small muscle mass exercises. These exercises will give optimal strength development only when adherence to the following principles occurs:

1. Overload - maximum strength gains result when a muscle is stimulated to create a level of force that exceeds that to which it is accustomed;
2. Progression - resistances must be regularly increased in order to ensure that the muscles are continually overloaded;
3. Specificity - only those muscles that are active and overloaded during training show significant improvements in strength (3).

The use of plyometrics in training is another method that has been sug-

gested for the development of strength and power and therefore may be beneficial for use by pitchers. Plyometrics is a method of training involving various jumping exercises. The principle of plyometrics is based on the ability of the stretch reflex to facilitate the recruitment of additional motor nerves and their muscle fibers. The explosive power derived from the leg extensor muscles used in jumping provides the same type of ballistic movement characteristics exhibited in most anaerobic power sports (4).

Jump training and box drills are the two most common forms of plyometrics. Jump training involves a series of horizontal or vertical jumps using both feet or single leg variations. Box training or rebound jumping involves the use of an elevated platform. Initially, the athlete jumps from an elevated surface (18 to 22 inches high) and is accelerated to the ground. Upon contact with the ground the athlete executes a maximal jump movement as quickly as possible. The maximal jumps are either vertical, horizontal or a combination of both (4).

Several guidelines need to be followed when using plyometric training:

1. Begin with double leg jumps and progress to single leg jumps.
2. Alternate days of training with days of rest.
3. Make sure the athlete has good footwear and is landing on a padded surface when performing box drills.
4. Develop a good strength base through weight training before using extensive plyometric drills.
5. Plyometrics are not tolerated well by all athletes; therefore, the coach should exercise caution when employing these drills (4).

Sprint training is also advocated as an essential component of an off-season and in-season conditioning program. Sprint training has been shown to enhance muscular strength, increase the anaerobic enzymes necessary for optimal power output and improve the muscle's recovery ability from anaerobic metabolism (5).

Listed below are two sprint training methods for the development of anaerobic power and metabolism (1).

1. Hollow sprints - two sprints interrupted by hollow periods of jogging or walking. (e.g. sprint 60 yards - jog 60 yards - sprint 60 yards)
2. Sprint training - repeated sprints at maximal speed with complete recovery between repeats.

#### **Off-season and In-season Program**

A hypothetical periodized model will be employed to provide an example of an off-season (**Table 2**) and in-season (**Table 3**) strength and conditioning program. Due to the high intensity level of this program, there is the possibility of an increased occurrence of injury. Coaches must be sensitive to this possibility and adjust the training program accordingly.

**Table 2. Off-season Conditioning Program**

A proper warm-up and cool-down period should be included with each exercise session.

**Strength Training**

1. Occurs three times per week
2. Alternate upper body and lower body exercises
  - A. Upper body - incline bench press, upright rowing, bent arm pullovers, tricep extensions, trunk extensions, weighted sit-ups
  - B. Lower body - squats, leg extension and curls, calf extensions, lunges, straight-leg deadlift
  - C. Supplemental exercises for wrist/forearm may be included

Week	Sets	Reps	Intensity
10-5	3	10	70% 1 RM or 100% 10 RM
5-1	3-5	5	100% 5 RM

**Plyometrics**

1. Occurs three times per week
2. Double and single leg jumps and weighted belts may be used to alter intensity
3. Exercise caution for larger athletes

Week	Exercise	Sets	Reps
8-6	vertical	5	10
	horizontal (double and single leg)	5	10
6-4	vertical	5	10
	horizontal (weighted belt)	5	10
4-2	box jumps - 18 inches	5	10
	vertical	5	10
	horizontal (double leg)	5	10
2-1	box jumps - 22 inches	3	10
	vertical	3	10
	horizontal (double leg)		

**Sprint Training**

1. Occurs three times per week
2. Alternate between hollow and sprint training
3. Allow complete rest between sets

Week	Type	Distance (yds)	Sets	Reps
10	hollow	120	2	10
9	sprint	120	2	10
8	hollow	90	2	10
7	sprint	90	2	10
6	hollow	90	3	10
5	sprint	60	3	10
4	hollow	60	3	10
3	sprint	60	3	10
2	hollow	30	3	10
1	sprint	30	3	10

Before beginning the conditioning program, each pitcher should be evaluated to determine strengths and weaknesses and establish individual goals. Efforts should be made to test muscular strength and power as well as muscular endurance, cardiovascular endurance, flexibility and body composition. These components can be measured using techniques outlined in various training books such as those referenced in this article and others.

In order to achieve maximum strength and power development, the off-season program should begin 10 weeks prior to the start of the practice. Initially, each pitcher will be placed on a weight training program involving workouts three times per week. During this period athletes will be attempting to perform three sets of 10 repetitions for each of the exercises previously described. Resistance should be placed at 70 percent of 1 RM or 100 percent of 10 RM. After five weeks of strength training, it is recommended that the number of sets be increased to three to five and the number of repetitions be decreased to five. Intensity levels should be increased to 100 percent of 5 RM. These changes are made in an effort to maximize strength and power development. As the strength program progresses, remember to keep in mind the principles of overload, progression and specificity.

On three off-days from lifting, a sprint training program should be employed by using alternating hollow and sprint training methods. Initially, two sets of 10 repetitions should be used. Distances should vary between 90 and 120 yards, which would be the maximum distances encountered during a baseball game. This workload should continue for four weeks, after which the distance should be reduced to between 60 and 90 yards. At this time three sets of 10 repetitions

should be employed. With two weeks remaining prior to beginning practice, the distance should be reduced to 30 yards. The number of sets will remain at three with each set containing 10 repetitions. Decreasing sprint times may be employed throughout the training program in an effort to monitor intensity.

Plyometric exercises should be included in the conditioning program at eight weeks prior to the beginning of the season. Initial training should be done three days per week using a combination of vertical and horizontal jumps. Five sets of 10 repetitions for both vertical and horizontal jumps is recommended as the beginning level. Progression from double to single leg jumps can be made when the athlete feels comfortable performing the exercises. Additional resistance can be gained by having the athlete wear a weighted belt.

After four weeks of plyometric training, box jumping drills may be included in the routine. Initial height of the box should be 18 inches. Double leg vertical and horizontal jumps should be performed from this level, with five sets of 10 repetitions each.

With two weeks left in the preseason training program, the box height should be increased to 22 inches. The number of sets performed is reduced to three and the repetitions are to remain at 10. Both horizontal and vertical double leg jumps are still being performed.

### **In-season Maintenance**

The importance of an in-season maintenance program is often overlooked by athletic coaches. Practice time, travel schedules and game competition make it difficult to adhere to a complete conditioning program. Without some type of maintenance program, strength and power gains developed in the preseason will

gradually be lost over time. A well-designed maintenance program should provide sufficient stress to the muscles in order to sustain the existing levels of strength. A reduction of intensity, duration and frequency is a necessary requirement for an in-season maintenance program. Preliminary research indicates that one or two exercise sessions per week are

sufficient to maintain existing levels of strength and power (5). A reduction in resistive exercise sets and reps along with a cessation of all plyometrics and a modification of sprint training is recommended as the proper maintenance program, once practice begins.

In-season weight exercises should consist of the squat, leg extension

**Table 3. In-season Conditioning Program**

The in-season strength and sprint training programs must be adjusted according to pitching schedules

#### **Strength Training**

1. Occurs one to two times per week
2. 2 to 3 sets
3. 3 to 5 reps
4. Intensity level = 60% 1 RM

#### **Exercises**

upper body - incline bench press, tricep extensions, weighted sit-ups  
lower body - squats, leg extensions and curls, calf extensions

supplemental exercises if selected

#### **Sprint Training**

1. Occurs three times per week
2. Alternate between hollow and sprint training
3. Distances = 30 and 60 yards
4. 3 sets
5. 10 reps

#### **Examples - In-season Maintenance Program**

Based on a five-day pitching rotation:

- Day 1 - pitch
- Day 2 - recovery day (may include light stretching activities)
- Day 3 - weight training and sprint training
- Day 4 - sprint training
- Day 5 - recovery day (light stretching activities)
- Day 6 - pitch

Based on a four-day pitching rotation:

- Day 1 - pitch
- Day 2 - recovery day (may include light stretching activities)
- Day 3 - weight training and sprint training
- Day 4 - recovery day (light stretching activities)
- Day 5 - pitch

and curls and calf extensions for the lower body. Upper body exercises should consist of incline bench press, tricep extensions and weighted sit-ups. The number of sets may vary between two and three, while the number of reps may vary between three and five. The intensity level should be 60 percent of 1 RM. Sets and reps may be adjusted depending on pitching rotation and muscular soreness within the arm.

The sprint training program must be modified according to the pitching schedule. A hard sprint training work-

out should be included in a pitcher's schedule at least two times per week. Scheduled workouts may vary depending upon the pitching rotation employed by the coach. Caution should be exercised so that no sprint training occurs the day before a scheduled pitching assignment. Distances should vary between 30 and 60 yards, with each pitcher completing three sets of 10 repetitions. Intensity levels should be maximal or near maximal during the workout. The timing of sprints may be used as a method to monitor intensity. ●

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