

**Science of Strength and Conditioning Series**

# **NSCA's Guide to PROGRAM DESIGN**



**NSCA™**

**National Strength and Conditioning Association**

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# Agility Training

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*Agility* can be defined as quick, full-body changes in direction and speed or simply the ability to change direction (2). Any casual observer of sport can describe the importance of such a skill to athletic performance. Most, if not all, field or court sports require agility for competition. For example, the extensive lateral movements in tennis required to sustain a rally and the frequent cutting motions in soccer, American football, and basketball clearly depict the prevalence of agility in sport.

On the playing field, an athlete typically performs rapid changes of direction in response to a stimulus. For instance, an American football player notices an oncoming opponent and, to avoid being tackled, reacts by cutting one way and running in the other direction. Long rallies between tennis players occur because they have the ability to adjust and change direction to cover the court as needed. This suggests a two-part model of agility: a visual and decision-making component in addition to a physical component (2, 20). This chapter focuses primarily on the physical components of agility. As a result, it examines training as it relates to developing the physical properties of improving change-of-direction ability, rather than highlighting visual decision-making processes (e.g., reaction time).

## Factors in Agility Performance

Designing an agility training program requires an understanding of how the body functions or acts while performing changes in direction. The act of changing direction can be described generally as a stop-and-go event that requires the athlete to stop the body (braking force) and restart movement (propulsive force) with minimal time between the two phases. As a result, training should target this quick stop-and-go ability.



## CROSSOVER SHUFFLE

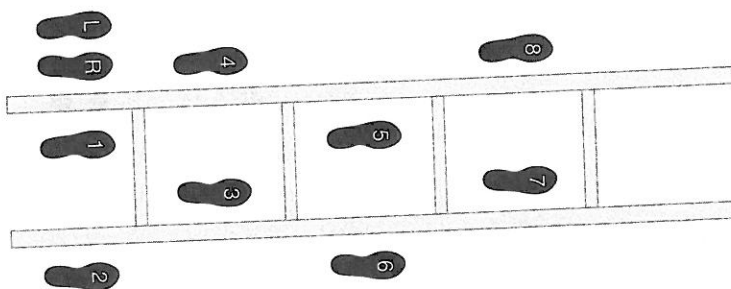
### PURPOSE

Increase flexibility and power in the hips, improve ability to change direction

### PROCEDURE

The athlete should do the following:

- Stand to the left of the ladder
- Cross the left foot over the right to step into the first square of the ladder
- Laterally step with the right foot to the right side of the ladder
- Immediately cross the right foot over into the second square
- Laterally step with the left foot to the left side of the ladder
- Repeat the process down the ladder
- Remember: Only one foot is in the ladder at any one time.



The above drills and diagrams, with the exception of double-leg lateral hopping are reprinted, by permission, from Brown LE, Ferrigno, VA. *Training for Speed, Agility, and Quickness*. 2nd ed. Champaign, IL: Human Kinetics; 2005. For many more drills and additional information on agility training, readers are encouraged to consult this text and its accompanying DVD.

## Agility Program Design

After an initial assessment of change-of-direction ability, the athlete can begin a training program to develop agility. Any training program, whether it is intended to develop strength, speed, or aerobic endurance, requires short- and long-term planning to maximize gains while minimizing fatigue and plateaus. This planning and development requires the manipulation of

For practical tips on integrating agility training and other forms of training in the context of an athlete's annual plan, see chapter 12.

what sport scientists and practitioners call *program variables*. These consist of selection, order, frequency, intensity, volume, and rest periods for exercises performed during a given training session (table 8.3). Whenever possible, recommendations are provided for the prescription

**TABLE 8.3** Summary of Acute Program Variables for Agility Training

Program variable	Guidelines
Exercise selection	Consider: <ul style="list-style-type: none"> <li>• Movement patterns</li> <li>• Distances encountered in competition</li> </ul>
Exercise order	<i>Novice</i> Least to most complex <i>Advanced</i> <ul style="list-style-type: none"> <li>• Least to most complex or</li> <li>• Most complex with decreased intensity to start</li> </ul>
Frequency	<ul style="list-style-type: none"> <li>• 2-3 times per week</li> <li>• Can increase or decrease based on training status of athlete</li> </ul>
Intensity	Maximum or near maximum
Volume	~5 drills (adjust accordingly based on individual readiness) <i>Novice</i> ~5-10 repetitions per drill <i>Advanced</i> 5-25 repetitions per drill
Rest	<ul style="list-style-type: none"> <li>• Work-to-rest ratio of 1:4 to 1:20</li> <li>• Adjust accordingly based on athlete training status and complexity of drill</li> </ul>

of program variables based on training studies that successfully improved change-of-direction ability. It will be assumed that the positive results from these studies occur from effective planning and implementation of program variables.

### Exercise and Drill Selection

The selection of individual drills should be based on what an athlete might encounter in a game situation. For instance, soccer players cover vast amounts of ground during the course of a game. Movement patterns performed by a typical field player include long sprints integrated with changes of direction when timing a run into open space so that teammates have an outlet to play the ball into. Therefore, the 40-, 60-, and 100-yard shuttle sprints, as well as the 40-yard lateral shuffle and the 55-yard sprint backpedal, would be appropriate training drills. The player performing a long shuffle drill (e.g., 40-yard lateral shuffle) would not run 40 yards straight, but might make eight change-of-direction runs of 5 yards each. These drills provide change-of-direction tasks in conjunction with comparable distances a soccer (football) player might cover. A similar approach could be taken for a wide receiver or a running back in

American football. Thus, the selection of agility drills should be made after identifying both the characteristics of the sport and differences among positions within the sport.

It should be noted that an athlete's initial training level will factor into the selection of exercises. A novice or deconditioned athlete will likely require an initial series of basic drills to get accustomed to the demands of training before progressing to more complex routines.

### **Exercise Order**

The order of agility drills within a training session largely depends on the training status of the athlete or population being trained. In general, a novice will perform less complex exercises (those of shorter duration and with fewer directional changes) prior to doing more complex ones (those longer in duration and with more directional changes). This allows the beginner to become familiar with the movement patterns and physical characteristics needed to perform change-of-direction tasks. Advanced athletes could use this same exercise order, with the less complex drills serving as a warm-up to get them ready for more advanced exercises. The advanced athlete may also go directly into complex drills at the start of the session, but perform initial repetitions at a lower intensity before going into maximal-effort repetitions.

### **Frequency**

*Frequency* refers to the number of training sessions performed during a given unit of time. Improvements in change-of-direction ability have been demonstrated in as little as twice per week for 4 weeks (2). The most common training frequency administered in successful training studies is two or three times per week (2). The duration of these training programs ranged from 6 to 14 weeks in length, with the most common period being 8 to 10 weeks (2). In any case, a consistent agility training program at a frequency of two or three times per week over the course of several weeks appears to be necessary for improvements in change-of-direction ability. Chapter 12 discusses the integration of agility training into the yearly training program.

### **Intensity**

A practical definition of *intensity* is the effort of a given exercise. Other modes of training usually prescribe intensity as a percentage of some maximum value obtained during an assessment of the training parameter. For example, resistance-exercise intensity is usually quantified as a percentage of one-repetition maximum (1RM). In aerobic exercise, it's quantified as a percentage of maximum heart rate (HRmax) or oxygen uptake ( $\dot{V}O_2$ max). Agility training, on the other hand, does not utilize manipulations in intensity the way a resistance or aerobic exercise program might. Athletes perform agility drills at maximum or near-maximum effort and speed to develop

change-of-direction ability because by definition, this stop-and-go event must occur very quickly, with minimal downtime between the two phases.

## Volume

Because intensity in agility exercises does not vary, volume is the program variable that must be manipulated to adjust the difficulty of the program. Volume represents the total quantity of exercises performed in a training session. It can be calculated by adding the number of repetitions performed per drill. A single repetition constitutes completion of a drill one time through (i.e., a complete sequence). If an athlete performs 5 repetitions of ladder drills and 5 of cone drills, the total volume performed is 10 repetitions or sequences. To increase volume, an athlete can perform more repetitions per drill or increase the number of drills performed during a training session.

Unfortunately, the optimal volume to bring about the best gains has not been identified in the scientific literature. There has also not been much research on the topic. Completing approximately 5 to 25 repetitions of five drills has been accepted as adequate training, with adjustments made for initial levels of fitness and the nature of the drills (i.e., complexity, difficulty) being performed (9). For example, the 100-yard shuttle sprint might be performed a total of 3 to 5 times because of the longer distance covered, while the 20-yard shuttle could be performed for 20 times total (two sets of 10 repetitions). A beginner may perform only 5 to 10 repetitions of a drill when first starting a new agility program, depending on the difficulty of the drill. In addition, the number of drills performed can also be adjusted based on individual readiness. The same number of repetitions does not need to be performed for each drill, and priority should be given to weak areas.

## Rest

Recovery periods should be provided between repetitions and drills so that technique can be maintained. A work-to-rest ratio between 1:4 and 1:6 should provide adequate recovery (9). For example, a drill lasting 15 seconds would use recovery intervals of 1 to 2 minutes. Adjustments can also be made to enable adequate recovery, based on an athlete's current fitness level and on the complexity of the agility tasks being performed. Athletes who are less fit may require longer recovery periods during a training session. Likewise, those using more difficult or challenging drills may require longer rest times. In fact, work-to-rest ratios as large as 1:20 are not uncommon, since the athlete should be ready and able to give a maximal effort on each repetition.

## Structure of Training Programs

A common agility-training session consists of components similar to other training modes, such as a general warm-up, specific warm-up, main session,



and cool-down. The general warm-up consists of low-intensity exercises that use large muscle groups (jogging) to raise core body temperature and prepare the athlete for training. The specific warm-up also serves as preparation, but it is more specific to the objectives of the training session.

For sample agility-training programs that target fast footwork in close quarters, changes of direction over varying distances, and the agility requirements of basketball players, see chapter 12.

This can be accomplished by performing a few agility drills at a lower intensity (walk through) to get the body primed for the change-of-direction tasks constituting the bulk of the training session. The cool-down, which consists of low-impact activity, can be thought of as a reverse warm-up that gradually brings the body back to preactivity levels.

### **SUMMARY POINTS**

- The frequent changes of direction performed in most field- and court-based sports highlight the importance of agility. Agility involves quick changes of direction and speed. Therefore, it relies on the capacity to very quickly stop the body (braking force) and restart movement (propulsive force).
- Like most other performance parameters, agility can be improved through a well-planned training program that utilizes acute program variables and the concept of specificity.
- The development of skilled change-of-direction ability requires agility-specific interventions. Therefore, athletes should train with agility drills.
- Agility drills should be selected to match the distance athletes will cover in a game situation and the types of changes in speed and direction they are required to make.
- To improve change-of-direction ability, agility drills need to be performed two or three times a week over the course of at least several weeks.
- Agility drills must always be performed at high intensity to be effective. The difficulty of agility training sessions can be manipulated through the number of drills performed and the length of rest intervals.