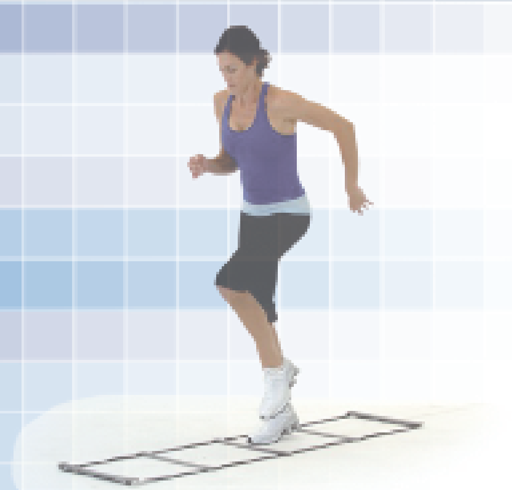
CHAPTER 9

Speed, Agility, and Quickness Training for Performance Enhancement



UPON COMPLETION OF THIS CHAPTER, YOU WILL BE ABLE TO:

- Describe speed, agility, and quickness training and its purpose.
- Rationalize the importance of speed, agility, and quickness training.
- Design a speed, agility, and quickness training program for athletes at any level of training.
- Perform, describe, and instruct various speed, agility, and quickness training exercises.

Introduction

Speed, agility, and quickness are some of the most significant, and visible, components of athletic success. An improvement in the ability to react quickly, apply significant force rapidly in the appropriate direction, and to redirect that force if needed is the ultimate goal of a program to improve speed, agility, and quickness. A carefully designed program that addresses these factors of athleticism significantly improves overall performance and reduces the risk of injury.

Speed, agility, and quickness all involve learned motor skills. Although the magnitude of proficiency will vary with each individual, learning the efficient and effective execution of these skills can improve overall athletic ability. This chapter aims to address the significant components of speed, agility/multidirectional speed (MDS), and quickness. Modalities and drills for improving these skills will also be introduced.

Training for Speed of Movement

Speed
The "rate of performance" of an activity.

In the context of athletics, **speed** is best defined as the "rate of performance" of an activity. This can refer to any movement or action. In athletics, the velocity at which one executes a movement can be the difference between success and failure. Speed is a culmination of reactive ability, rapid force development, rapid force application, and effective movement technique. Generally, when the force demands of an activity increase, the velocity output of the movement decreases (1) as demonstrated by the force-velocity curve (Fig. 9.1). The goal of a speed-training program is to move this curve up and to the right, which would mean being able to create greater force at higher

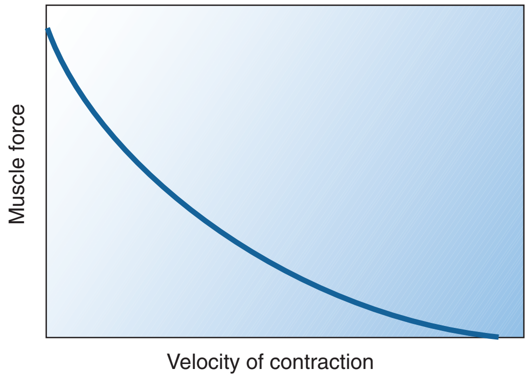


FIGURE 9.1 Force-velocity curve.

velocities of movement. This, in combination with an ability to maintain biomechanically advantageous body and limb positioning, creates an increase in the velocity of movement.

Speed of movement greatly affects an athlete's abilities in regards to linear speed, agility/MDS, and quickness. The following are essential components of a well-designed program to improve speed of movement:

- Stability, strength, and power
- Muscle and joint elasticity
- Joint mobility and flexibility
- Movement technique
- Specialized drills

STABILITY, STRENGTH, AND POWER

Stability, strength, and power training help shift the force-velocity curve up and to the right (2). While stability training develops appropriate balance, strength training improves the body's ability to create force, and power training aids in decreasing the amount of time needed to create that force. These all have significant contributions in regards to improving speed. When performing stability, strength, and power drills specific for speed development, it is important to include exercises for contributing areas, such as the feet, anterior and posterior muscles of the shins, the core, and hip flexors/extensors as part of a whole-body program. In addition, movements that emphasize powerful plantar and dorsiflexion of the ankle, as well as extension and flexion of knee and hip are also important components. Please refer to Specialized Strength Exercises for Speed section in this chapter for these drills.

MUSCLE AND JOINT ELASTICITY

Ballistic movement, as found in speed, agility, and quickness training, is created by a forced and rapid lengthening of a muscle immediately followed by a shortening of the muscle, creating an elastic "rubber-band-like" effect of energy release. As mentioned in Chapter 8, this ability to store and release energy is referred to as the **stretch-shortening cycle** and is affected by the intrinsic qualities of the muscle and the involved musculotendinous junctions (2). This action is often reflexive, and referred to as the "stretch reflex." Training the muscle and tendon's ability to load eccentrically and rapidly release energy concentrically improves the magnitude and effectiveness of the stretch-shortening cycle (2). This is achieved through power training and plyometrics. Please refer to Chapter 8 in this text for more information on how to improve these components.

Stretch-Shortening Cycle

An active stretch (eccentric contraction) of a muscle followed by an immediate shortening (concentric contraction) of that same muscle.

JOINT MOBILITY AND FLEXIBILITY

Joint mobility is the ability of a joint to move through its natural, effective range of motion and is further characterized as the balance of strength and flexibility regulating contrasting motions around a joint (i.e., flexion and extension). In addition, the integrity of the muscle tissue and its ability to relax and contract appropriately during movement is a limiting factor in producing effective joint mobility. For example, when a sprinter comes out of the blocks, proper range of motion during hip extension requires strength of the hip extenders, as well as the ability for the hip flexors to lengthen properly to allow for full hip extension (Fig. 9.2). If there is an imbalance of strength and flexibility about the hip, range of motion will be compromised, which will in turn affect force output and speed of movement. In addition, if the muscle tissue is not responding properly due to injury, adhesions, or other factors, performance will be diminished. This can be improved with flexibility training (Chapter 4).

FIGURE 9.2 Appropriate flexibility and range of motion.

MOVEMENT TECHNIQUE

Proper movement technique while executing speed, agility/MDS, and quickness drills allows the body and limbs to achieve biomechanically advantageous positions for optimal force production, thereby increasing speed of movement. Movement technique for speed, agility/MDS, and quickness skills will be discussed and demonstrated later in this chapter.

SPECIALIZED DRILLS

Most athletes wishing to improve speed of movement follow a very general program to develop strength, mobility, power, and general athletic ability. General movement patterns (e.g., running, jumping, throwing) are used to develop strength and power. These movement patterns also help develop the basic motor skills required to move efficiently in space and decrease an athlete's risk of injury. Although these programs function well for the beginner to intermediate athletes in a particular sport, more advanced methodologies are necessary for higher-level athletes. After sound mechanical proficiency is established, specialized drills are effective in facilitating the specific demands of an athlete's sport. These drills reinforce proper movement patterns in a sport-specific environment while adding heightened demands to the neuromuscular system. These drills often imitate sport scenarios while adding additional reactionary, force, or other neuromuscular demands. A common means of adding neuromuscular load to movement drills is by applying the concepts of resisted and assisted speed.

OVERSPEED OR ASSISTED DRILLS

Overspeed or "assisted" running drills involve apparatus or running surface grade changes that aid in accelerating an athlete's movement. Moderate grade (5–6%) downhill running, assisted bungee cord movement, and other "towing" mechanisms are used for this type of training (Fig. 9.3). The prevalent theory is that as the athlete is accelerated at a rate he or she is unaccustomed to, the adaptations involved will train the neuromuscular system to work at higher speeds. Assisted speed drills are effective for improving stride frequency, a key component to running speed (3,4). Because this type of training is done at speeds beyond the body's normal capabilities, it is important to have a sound mechanical foundation in order to attain maximal effectiveness and prevent injury. These drills are not recommended for beginners.

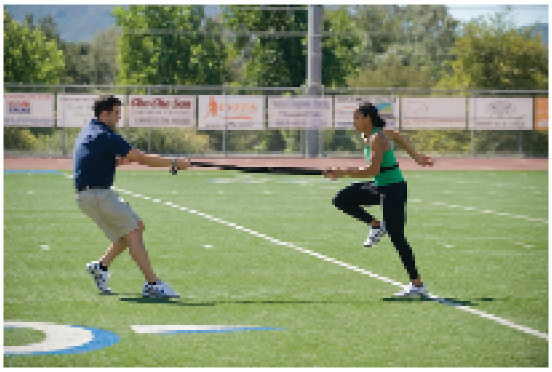


FIGURE 9.3 Assisted drills.

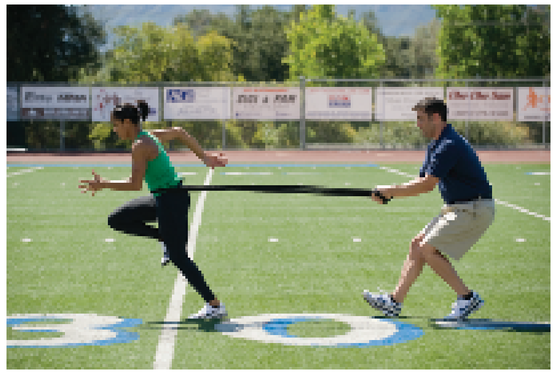


FIGURE 9.4 Resisted drills.

RESISTED SPEED DRILLS

Resisted speed drills involve the athlete moving against increased horizontal or vertical load (Fig. 9.4). This aids in improving force production during the drive phase of the running stride, aiding with improvements in stride length (3). As mentioned later in this chapter, this is significant in regards to increasing movement speed. Weight vests, sled pushes and pulls, uphill running, and partner-resisted drills are all types of resisted speed drills. Light loads (10% of body weight) are generally recommended for maximal skill carryover, because they allow for technique, joint velocities, and loads similar to that for competition (3,5). However, many coaches and trainers use loads much higher in order for further overload to develop leg strength specific to speed skills, such as acceleration. As with any load-intensive resistance program, it is important that proper progression is observed.

Developing Linear Speed, Agility/MDS, and Quickness

LINEAR SPEED

Linear Speed *The ability to move the body in one intended direction as fast as possible.*

Stride Rate *The amount of time needed to complete a stride cycle and is limited by stride length.*

Stride Length *The distance covered with each stride and is improved by increasing the amount of force applied into the ground.*

Although sports often have multidirectional movement demands, **linear speed** development establishes a basis for general, efficient movement technique. In addition, even during multidirectional movement after initial direction change, the body attempts to align itself as linearly as possible to maximize force production and running velocity. Linear speed in sports can be defined as the ability to move the body in one intended direction as fast as possible. Linear speed is a product of **stride rate** and **stride length** (3,6,7). Stride rate refers to the amount of time needed to complete a stride cycle and is limited by stride length. Stride length refers to the distance covered with each stride and is improved by increasing the amount of force applied into the ground (Fig. 9.5) (3). Research suggests that optimal stride length for maximal speed in sprinting is 2.3 to 2.5 times the athlete's leg length (8).

FIGURE 9.5 Stride length.

Improvements in stride length and frequency must happen by making adjustments in overall mechanics and force production (5). Attempting to "force" adaptations in either one of these factors is ineffective. For example, attempting to increase stride length by reaching for greater distance with each stride often results in "overstriding," where the foot contacts the ground well in front of the body's center of gravity, and is sometimes mentioned as a factor in hamstring strains (9). "Overstriding" creates a decelerative force and slows movement. Attempting to force faster foot contact to increase stride frequency results in a significantly shorter stride length. As you can see, achieving maximal running speed is a product of an optimal relationship between stride length and frequency (3,6,8). All training modalities in a linear speed program are focused on improving this relationship.

LINEAR SPEED TECHNIQUE

As previously mentioned, linear speed technique aids in establishing a foundation for effective movement. Although this section discusses movement technique in regards to a linear orientation of the body, nearly every one of these concepts is important to multidirectional movement as well. Posture, arm movement, and leg movement must all be executed correctly to achieve maximal performance during linear speed development. These can all have an effect on creating optimal frontside mechanics (dorsiflexion, knee and hip flexion) (Fig. 9.6), backside mechanics (plantarflexion, knee and hip extension), and ability to maintain a neutral pelvis (Fig. 9.6) (6). The three distinct phases during the stride cycle are the **drive phase**, when the foot is in contact with the ground; the **recovery phase**, when the leg swings from the hip while the foot clears the ground; and the **support phase**, where the runner's weight is carried by the entire foot (3). Posture, arm movement, and leg movement must all be executed correctly to optimize force production and velocity at each phase. The ideal technique for effective, efficient running speed depends on the specific needs of the desired task in the sport. For most sports, an ability to rapidly increase running or movement velocity is necessary; this is called acceleration. The maximal running speed one is able to attain is referred to as maximal speed. The mechanical differences between acceleration and maximal speed will be discussed later in this chapter. Athletic proficiency for many sports demands effective mechanical execution of both.

Drive Phase *When the foot is in contact with the ground.*

Recovery Phase *When the leg swings from the hip while the foot clears the ground.*

Support Phase *Where the runner's weight is carried by the entire foot.*

Please refer to Table 9.1 for proper movement mechanics for both maximal speed and acceleration.

Also listed in Table 9.1 are common errors observed, their common causes, and effective drills for correction. For illustration of these drills, please refer to "Drills for Speed, Agility/MDS, and Quickness" at the end of this chapter.

Proper execution of running technique is the foundation of improving running speed. Proficient movement mechanics during linear speed provides a foundation for other movement skills. Programs should aim to establish sound linear speed mechanics before progressing on to more advanced skills. For technique and specialized drills for linear speed, please refer to Technique and Specialized Drills for Linear Speed later in this chapter.

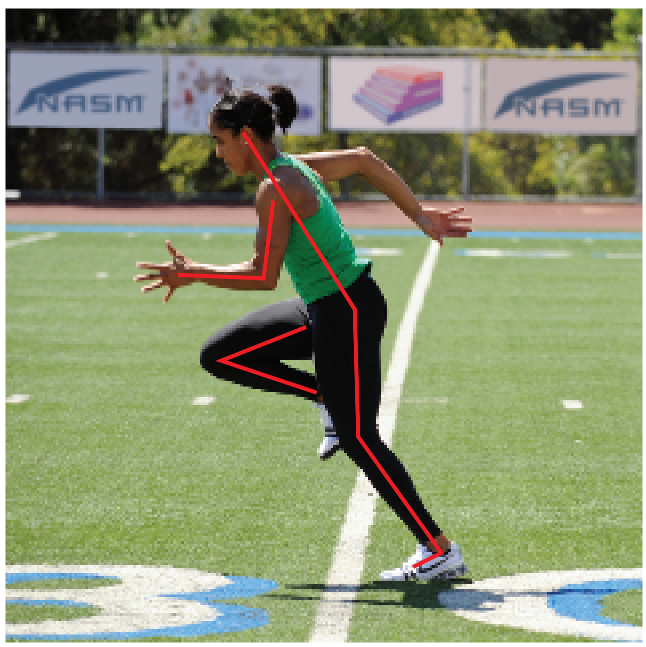


FIGURE 9.6 Frontside and backside mechanics.

TABLE 9.1

Proper Linear Sprint Mechanics

Body Part	Motion Summary	Problem	Cause	Drills for Correction
Head	As an athlete initiates acceleration, the head must cast downward. This initiates forward movement by placing the weight of the head slightly in front of the body's center of gravity. As the athlete approaches maximal running speed, the head is raised to be in line with the vertical axis of the body.	Improper flexion or extension at the head	Fatigue or poor execution of proper mechanics	Coach to maintain proper eye focus ahead or slightly downcast, depending on the specific acceleration or maximal speed drills
Shoulders	Shoulders should create an exaggerated flexion and extension opposite lower-body movement (hip flexion/extension). During acceleration, shoulder extension (driving elbows backward) should cease when the hands are past the buttocks posteriorly (3). Shoulder flexion should cease as the hands rise above forehead level. Proper, aggressive shoulder extension during acceleration and maximal speed aids in proper contralateral movements, such as hip and shoulder flexion. Attempts should be made to minimize shoulder abduction and thoracic rotation, keeping the elbows close to the body (3). This results in the hands approaching, but not crossing, the body's vertical midline. As the athlete approaches maximal speed, shoulder flexion and extension maintains a high amount of force, but movement at the shoulder joint decreases in range of motion. The shoulder should flex to observe the hands even with the nose. Forcible shoulder extension is maintained to move the elbows "down and back". The role of arm action shifts from creating propulsive force during acceleration, to facilitating balance of the contralateral hip flexion during maximal speed (6). During acceleration and maximal speed, shoulders should stay relaxed and swing naturally.	Tight and elevated shoulders during running Movement of the hands across the midline during flexion and extension, causing excessive rotation of the upper body	Arm movement too forced and not natural Lack of coordination of contralateral hip and shoulder flexion/extension; overcompensation for poor hip flexion	Standing arm swings; relaxed shoulders while marching or skipping Standing arm swings; A-skips; cycling B-skips; weighted arm swings; proper technique focus during all drills
Elbows	Elbows should be bent at 90 degrees during shoulder flexion with fingers extended. During shoulder extension, the angle at the elbow may naturally open slightly, but must close to 90 degrees once again during shoulder flexion. Wrists should remain neutral with the fingers extended. This movement pattern is maintained as the athlete approaches maximal speed.	Excessive flexion or extension	Poor neural patterning	Standing arm swings; marches; A-skips; cycling B-skips; weighted arm swings; proper technique focus during all drills

(*continued*)

TABLE 9.1

Proper Linear Sprint Mechanics (*Continued*)

Body Part	Motion Summary	Problem	Cause	Drills for Correction
Hips	During acceleration, hip flexion, as a result of contralateral shoulder extension, should reach a point slightly below parallel to the ground. Hip extension should be explosive yet movement of the thigh posteriorly beyond the body's center of gravity should be minimized to less than 20 degrees (5). As the athlete approaches maximal running speed, hip flexion approaches 90 degrees. Hip extension should remain explosive, yet posterior movement past the body's center of gravity must still be minimized. The pelvis must stay neutral during acceleration and maximal speed.	Inadequate hip flexion	Poor neural patterning; weak hip flexors; tight hip extensors	Flexibility drills for piriformis, hamstrings, (refer to Chapter 4); resisted knee drives; marches; A-skips; 1/3/5 wall drill
		Inability to produce adequate force during hip extension (ground push-off)	Weak posterior chain; tight hip flexors; inadequate ankle mobility	Mobility and flexibility drills for ankle and hip flexors (see Chapter 4); strength, power, and plyometric drills focusing on triple extension of the ankle, knee, and hip (see Chapters 8 and 10); 1/3/5 wall drills; resisted speed drills
		Excessive lumbar extension throughout stride cycle	Weak core and glute muscles; tight hip flexors	Core strengthening drills (refer to Chapter 6); hip flexor flexibility drills (refer to Chapter 4); 1/3/5 wall drills; resisted sprints; superman planks
Knees	During the drive phase in acceleration, the knee is fully extended to allow for maximal hip extension with the foot slightly behind the center of mass. The knee then flexes as the hip flexes during the recovery, driving the heel directly up toward the buttocks and over the opposite knee (8). During maximal hip flexion, the knee is flexed, leaving the shin nearly parallel to the ground. As the hip begins to extend again, the knee is allowed to swing open to create an angle that is roughly 90 degrees with the shin before it is rapidly extended once again during foot contact. As the athlete approaches maximal speed, the more perpendicular body angle to the ground allows for greater hip flexion, and therefore higher knee and heel lift.	Knee height is too low during running stride, not allowing for adequate stride length	Inadequate hip flexion during the drive phase of the running stride	Resisted knee drives; marches; A-skips; resisted sprints
		Knee adduction during the stance phase of stride cycle	Poor ankle mobility; weak abductor/external rotators; tight adductors/internal rotators	Flexibility exercises for gastrocnemius/soleus/Achilles complex (see Chapter 4); tube walks; single-leg balance drills (see Chapter 7); single-leg strength drills (see Chapter 10)

(*continued*)

TABLE 9.1

Proper Linear Sprint Mechanics (*Continued*)

Body Part	Motion Summary	Problem	Cause	Drills for Correction
Ankle and heel	The ankle should remain dorsiflexed to allow for proper foot contact on the ball of the foot during the drive phase. At foot contact, the angle created between the shin and the foot should be close to 45 degrees, referred to as a "positive shin angle" (6). This allows for the appropriate amount of horizontal force to be applied in the posterior direction. As the foot comes off of the ground during recovery, the heel is raised toward the buttocks to "step" over the opposite knee. The height of the heel is related to the height of the knee during hip flexion, so the height of the heel begins rather low during acceleration and increases as maximal speed is approached. Due to overcoming initial inertia during acceleration, ground contact time of the foot is slightly greater than at maximal speed. As maximal speed is approached, foot contact is still on the ball of the foot, but is slightly higher toward the toes. The ankle remains dorsiflexed, but as the foot contact moves forward slightly to a point directly under or slightly in front of the body's center of gravity, the angle between the foot and shin becomes less acute. Ground contact time for the foot is decreased as maximal speed is achieved.	Inability to maintain dorsiflexion throughout stride cycle Foot contact time too long, resulting in decreased stride rate	Improper coaching ("run on the toes"); weak tibialis anterior, tight gastrocnemius/ soleus/Achilles complex Inability to maintain dorsiflexion; improper backside mechanics; foot contact too far in front of center of gravity	Mobility and flexibility exercises for gastrocnemius/ soleus/Achilles complex (see Chapter 4); reverse calf raises; A-skips; 1/3/5 wall drills Reverse calf raises; A-skips, cycling B-skips; assisted sprints
Body angle in relation to the ground	During initial acceleration, the body angle should be about 45 degrees to the ground. This allows for maximal force to be created posteriorly. A straight line should be observed from the top of the head, down the spine, through the extended rear leg. As the athlete approaches maximal speed, the body angle increases to near perpendicular to the ground. This allows the hips to continue to drive the body's center of gravity forward.	Improper body angle at phase of running (i.e., acceleration vs. maximal speed)	Improper coaching (bend forward, or "stay low" while sprinting); poor neural patterning	Core strengthening drills (see Chapter 6); superman planks; 1/3/5 wall drills; resisted and/or assisted speed drills

FIGURE 9.7 Agility and MDS.

Agility
The ability to change direction or orientation of the body based on rapid processing of internal or external information quickly and accurately without significant loss of speed.

Multidirectional Speed
Being able to create speed in any direction or body orientation (forward, backward, lateral, diagonal, etc.).

AGILITY AND MULTIDIRECTIONAL SPEED

Although running speed is generally correlated with athleticism, the ability to adapt and redirect speed appropriately to the needs of the game is an essential skill for athletic success, especially in team sports. The ability to change direction or orientation of the body based on rapid processing of internal or external information quickly and accurately without significant loss of speed is called **agility** (6,8). Being able to create speed in any direction or body orientation (forward, backward, lateral, diagonal, etc.) is referred to as **Multidirectional Speed (MDS)** (6). An athlete adept in these skills is effective at being able to create and control speed in any direction rapidly (Fig. 9.7). Castello and Kreis (10) observed a direct correlation between increased agility and development of athletic timing, rhythm, and movement. These are key coordinative components of athleticism.

Agility/MDS training often closely resembles the actual sporting activity and may, therefore, be the most effective way to address neuromuscular demands required to perform sport specific skills (11). The primary effect of agility/MDS training is improvement of overall body control and awareness (12). This aids in heightening overall athleticism, which improves proficiency at nearly every athletic activity.

General skills and concepts learned during linear speed training apply to agility/MDS, such as effective force production, posture, and proper lower- and upper-body orientation and movement. Agility/MDS has many specific skill demands, however, that must be addressed in creating a training program to improve these essential components of athleticism.

According to Gambetta (6) the key components of agility training are:

- Body control and awareness
- Recognition and reaction
- Starting and first step
- Acceleration
- Footwork
- Change of direction
- Stopping

These all involve development of motor skills and can therefore be trained.

Effective movement for agility/MDS is a culmination of these skills, in addition to others mentioned earlier in this chapter related to general speed of movement. Because these skills must be highly integrated during game performance, they are often trained simultaneously during agility/MDS drills. For beginners and other athletes wishing to work on specific aspects, agility drills can be broken down into individual components.

Much like movements in sports, agility/MDS drills can be planned or reactive based (6). In planned drills, athletes know ahead of time what is coming, so they know exactly how to react. Drills involving cones or other markers in which athletes knows ahead of time what action they are supposed to take when they reach the marker are planned drills. These are the most basic agility drills and can be used to teach proper movement patterns to beginners. Reactive drills incorporate an unpredictable environment that more closely mimic the athletic contest. The athletes may be required to react to a sound, an opponent or coach's movement, or other varying stimuli. They are unable to plan or predict when and what certain stimuli will be presented; thus, they must react once they see it. This requires a much higher level of neural processing as well as neuromuscular coordination. A large majority of agility/MDS drills for advanced athletes should be reactive in nature.

When you are selecting the appropriate drills for agility/MDS, keep in mind the demands of the sport and the level of the athlete. The development of agility/MDS skills should follow a progression, beginning by learning the appropriate movement skills for acceleration, deceleration, and change of direction. Introduction of these movements may be static, then as the athlete progresses, dynamic movements are utilized in planned drills, focusing on speed of movement. After proficiency is obtained, reactive drills are introduced. Figure 9.8 illustrates the progression model for agility/MDS skill acquisition and performance application. For techniques and specialized drills for agility/MDS, please refer to Technique and Specialized Drills for Agility and MDS in this chapter.

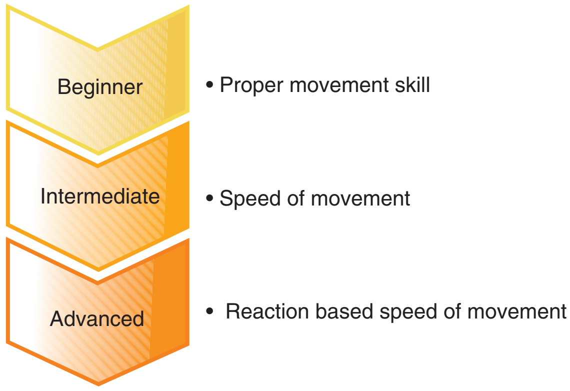


FIGURE 9.8 Agility/MDS Progression Model.

QUICKNESS

An athlete's ability to execute movement skill in a comparatively brief amount of time is part of the athleticism continuum referred to as **quickness**. Quickness addresses the quality and magnitude of the athlete's perceptive and reactive abilities and may be one of the most significant components contributing to athletic success (13). A "quick" athlete is able to assess a game situation and apply the necessary actions at a very high speed. Although many may possess a high level of performance for other variables such as speed, power, agility/MDS, and other game skills, the athlete who can apply these appropriate skills at the right time at the highest rate will be the most successful.

Quickness training involves developing biomotor skills related to decreasing **reaction time**. This is the time elapsed between the athlete's recognizing the need to act and initiating the appropriate action. In athletics, aside from the time it takes to initiate an appropriate reaction, the time it takes to execute the reactionary movement is of concern. The summation of these is referred to as total response time (13,14). The goal of quickness training is to address the mechanisms involved with **total response time** and improve the related motor and perceptual skills. Although elite athletes are often genetically predisposed to efficient, coordinated, high-level reactive motor skills, concepts of motor learning and control can aid in developing even faster reaction and total response times.

Training for quickness is a process of taking all of the skills required for effective speed and agility in addition to the specific skills needed in a sport, and applying them to the reactionary demands of that sport. This process begins with general coordination and teaching effective, sport-specific movement patterns. After proficiency is established, speed of movement is addressed. Efficient movement is then paired with specific reactionary demands the athlete will face while playing their sport. Finally, a large amount of competitive game experience will allow for accurate, game-specific application of these skills. Take a soccer athlete, for example. Soccer requires effective acceleration, top-end speed, deceleration, and direction change. In the initial phases of training, the focus of the program should be teaching the technique drills for the aforementioned skills. After these movements are mastered, an athlete can be practiced in game-like planned drills, such as the T and box drills described later. Execution of these drills can be timed to monitor speed and proficiency. After an established time criteria is met, the soccer ball can be added to make the drills game-specific. In addition, reactionary demands replace the practiced, predictable patterns of the above drills. Cones may be removed from the T drill and the athlete must then respond to a coach's whistle or visual cue. Finally, scrimmages and game scenarios are added to training, still keeping proper movement skills in mind, but adding the demands of the actual game. Continuous practice of the above process results in a quick, successful athlete.

Figures 9.9 through 9.45 are illustrated drills for improving the components of linear speed, MDS, and quickness. Refer to Table 9.2 in regards to which drills apply specifically to individual sports.

Quickness *An athlete's ability to execute movement skill in a comparatively brief amount of time is part of the athleticism continuum.*

Reaction Time *The time elapsed between the athlete's recognizing the need to act and initiating the appropriate action.*

Total Response Time *The summation of the reaction time and the time it takes to execute the reactionary movement is of concern.*

Example Drills for Speed, Agility/MDS, and Quickness

SPECIALIZED STRENGTH EXERCISES FOR SPEED

RESISTED KNEE DRIVES

FOCUS: Special strength for hip flexion
REPETITIONS: 10–20 each leg

FIGURE 9.9 Resisted knee drives.

SUPINE HEEL PUSHES

FOCUS: Special strength for hip extension
REPETITIONS: 10–20

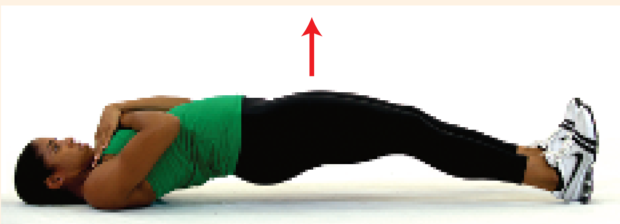


FIGURE 9.10 Supine heel pushes.

TUBE WALKING

FOCUS: Special strength for hip ad/abduction
REPETITIONS: 10–20 each way

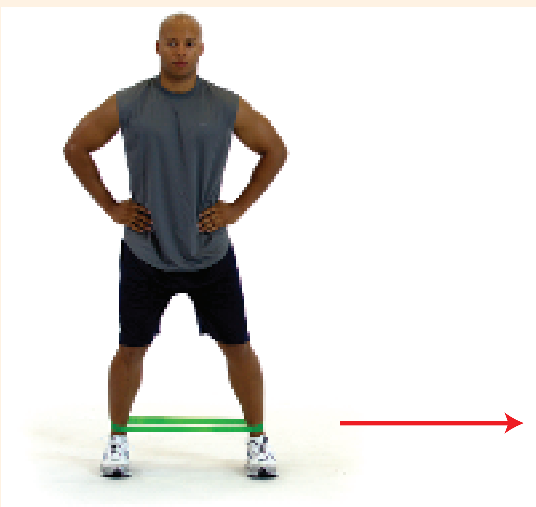


FIGURE 9.11 Tube walking.

REVERSE CALF RAISES

FOCUS: Special strength for dorsiflexion
REPETITIONS: 10–20

FIGURE 9.12 Reverse calf raises.

SUPERMAN

FOCUS: Special trunk strength to maintain correct running posture
TIME: 20–40+ seconds

FIGURE 9.13 Superman.

WEIGHTED ARM SWINGS

FOCUS: Special strength for flexion/extension of shoulders during running
TIME: 10–20 seconds

FIGURE 9.14 Weighted arm swings.

BIG TOE CORD FLEXIONS

FOCUS: Special strength for flexor hallucis muscle. This muscle plays a large role in stability and power production from the feet.
REPETITIONS: 10–20

FIGURE 9.15 Big toe cord flexions.

TECHNIQUE AND SPECIALIZED DRILLS FOR LINEAR SPEED

MARCHES

FOCUS: General running technique
DISTANCE: 15–20 yards

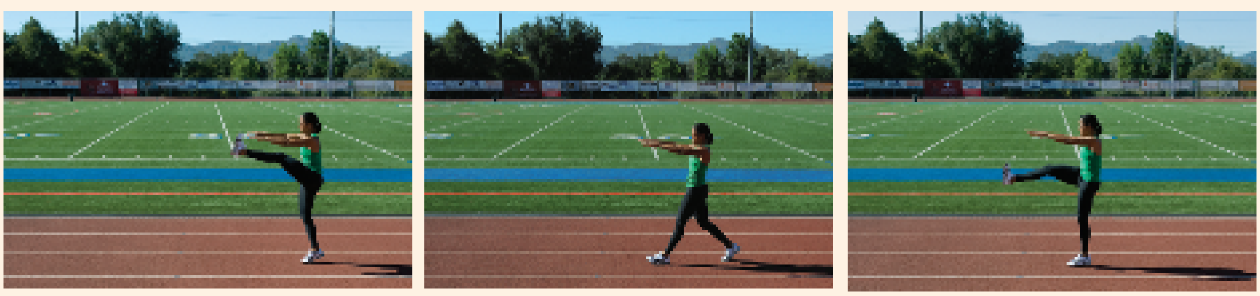


FIGURE 9.16 Marches.

A-SKIPS

FOCUS: General running technique
DISTANCE: 15–20 yards

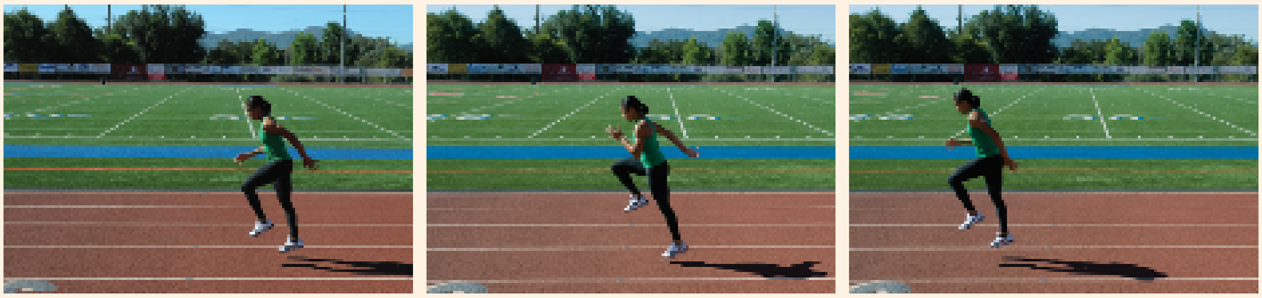


FIGURE 9.17 A-skips.

CYCLING B-SKIPS

FOCUS: General running technique
DISTANCE: 15–20 yards

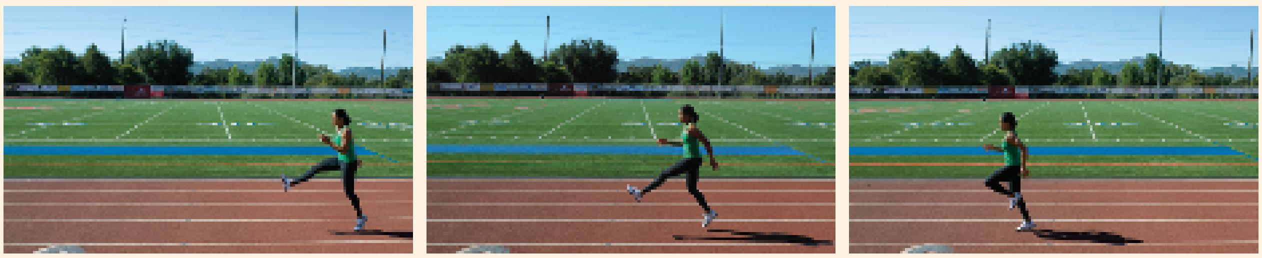


FIGURE 9.18 Cycling B-skips.

1/3/5 WALL DRILL

FOCUS: Linear acceleration technique
REPETITIONS: About 5

FIGURE 9.19 1/3/5 wall drill.

STANDING ARM SWINGS

FOCUS: General running technique
TIME: 5–10 seconds

FIGURE 9.20 Standing arm swings.

PUSH-UP SPRINTS

FOCUS: Specialized drill for acceleration
DISTANCE: 10–20 yards
DRILL PROGRESSION: Reaction can be introduced by having two athletes race, or by varying the start stimulus. Athlete can also begin supine, backward, etc.

FIGURE 9.21 Push-up sprints.