SPEED, AGILITY AND QUICKNESS STUDY GUIDE

SPEED TRAINING

Think of how many critical game situations are won or lost by the ability of the athlete to shift into high gear. While you are born with a predetermined number of slow and fast muscle fibers, there is no question that maximum running speed can be improved with proper training. Increasing maximum running speed has a direct correlation with increasing one’s power output.

THE FOLLOWING COMPONENTS MAKE UP MAXIMUM RUNNING SPEED.

**Acceleration** – Acceleration, which is the rate of change of velocity, is the most important component of speed development.

**Stride Frequency** – This is the number of strides taken in a given amount of time or distance. Sprint-assisted training is one technique that can be used to improve stride frequency (downhill running and towing).

**Stride Length** – This is the distance covered in one stride during running. Improving the athlete’s elastic strength, which is the ability to quickly go from eccentric to concentric muscle actions, can develop stride length. Methods of training: resistance training, plyometrics and resisted running, weighted vests, running chutes, and harnessed and uphill running.

**Power** – Is the ability to generate the greatest amount of force (strength) in the shortest possible time.
**Sport-Specific Speed** – It is the quick bursts of speed that are required to catch a ball or overtake an opponent. These are a blend of agility, acceleration, and speed.

**Functional Strength** – Increasing overall strength will allow the athlete to produce greater amounts of force, while at the same time decreasing their ground contact time.

**Proper Sprinting Position:**

**Head Position:** It should be in line with the torso and the torso should be in line with the legs at all times.

**Body Lean:** A slight forward lean during acceleration. At maximum speed the torso should be erect and tall.

**Leg Action:** The foot should be maintained in a dorsiflexed (toes up) position through the running cycle, except when the foot is in contact with the ground. At this point the weight should be on the ball of the foot (never on the heel). The greater the running speed, the higher the heel should kick up. Avoid placing the front foot too far in front of the center of gravity.

- **The drive** is the starting or acceleration push off action.
- **The stride** is the full-flight striking or pushing action.
- **The lift** is the kick at speed or pulling action.

**Arm Action:** Aggressive arm action is a must. Each arm should move as one piece with the elbow bent at about 90 degrees. Hands remain relaxed and should come up to about nose level in the front and should pass the buttocks in the back. Arm action is always straightforward and backward. Arm swing should originate from the shoulder and not involve excessive flexion and extension of the arm.

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**AGILITY TRAINING**

*Agility is the ability to decelerate, accelerate, and change direction quickly while maintaining good body control without decreasing speed.* Balance plays a role in agility because it requires the athlete to shift in the body’s center of gravity while in motion. The key to improving agility is to minimize the loss of speed when shifting the body’s center of gravity.
Types of agility drills:
1. Programmable – The athlete knows beforehand what the movement combinations will be.
2. Reactive – The athlete is required to react to the movement of another athlete or signals from a coach.
3. Quickness – The athlete is required to perform fast foot movements as quickly as possible.

Creating Agility Programs:

**Strength** – This refers to the maximal force that a specific muscle or muscle group can generate at a specified velocity.

**Power** – This is the single most important aspect of training. It refers to the rate at which work is done (force x velocity). The faster an athlete gets from one point to another, the greater his or her power. So it can be increased by improving speed.

**Acceleration** – Is measured by the change in velocity per unit of time. It plays a central role in going from a stationary position to top speed and then quickly increasing speed again on making a directional change.

**Deceleration** – Is the ability to decrease speed or come to a stop from a maximal or near-maximal speed. It is key to slowing the body down to speed at which one can change direction quickly and then reaccelerate. It involves eccentric muscle actions. It places a good deal of stress on the joints and is a main source of injury among athletes.

**Coordination** – Involves the ability to control and process multiple muscle movements in order to effectively perform athletic skills.

**Dynamic Balance** – The ability to maintain control over the body while in motion.

**BALANCE TRAINING**
The body must be kept in balance to avoid falling over. Balance training prepares athletes to perform when their center of mass moves outside their base of support.

**QUICKNESS TRAINING**

**Quickness** - is the reaction to a stimulus with speed.

**Reaction time** – is the length of time it takes to initiate a movement.

**Total response time** – is the mental processing time as well as the duration to perform the specific movement.

**Anticipation** – is to predict what and when something is going to occur.
PLYOMETRICS

Plyo + metrics means measurable increases. These are exercises that enable a muscle to reach maximum strength in as short a time as possible. Plyometrics is one of the main training principles used in the training of speed and agility. You must be conditioned before jumping into a plyometrics program. Resistance training and anaerobic training help prepare the body for plyometrics. The concept of plyometrics (loading and unloading) works on the concept of activating the stretch reflex (loading or stretching the muscles) before the jump. When you explosively complete the action and throw the ball, you are unloading (the stretch reflex sends a powerful message to the muscles causing them to contract faster and with more power).

Terms:

Ligaments – are tough, dense, fibrous tissues that attach bone to bone to provide both support and mobility.

Tendons – are fibrous structures that attach muscles to bones.

Concentric – is the shortening of the muscle, when there is a decrease in the angle of the joint. It is the positive phase.

Eccentric – is the lengthening of the muscle, when there is an increase in the angle of the joint. It is the negative phase.

Isometric – is a static position in which there is no muscle shortening or lengthening.

Stretch-shortening cycle (ssc) is when an eccentric action precedes a concentric; the resulting force output of the concentric action is increased. Example is when a jumper precedes the jump by bending at the knees and hips and then explodes upward.

Stretch reflex – responds to the rate at which a muscle is stretched. Example is when the doctor taps your knee with the rubber mallet to check your reactions.

Slow twitch fibers – are capable of producing sub maximal force over extended periods. These are the fibers involved in aerobic activities.

Fast twitch fibers – are capable of producing maximal force for brief periods. These are used for strength and power and are involved in anaerobic activities such as sprinting.

Power training – using 80-90% of one-repetition maximum for repetitions of 4-6.

Static stretching – you put the muscle in a stretched position and hold for 6-15 seconds. Static stretching is a safer form of stretching.
Ballistic stretching – involves elongating a muscle to its normal length, bouncing gently against the end of the range 6-12 times. You should only do this kind of stretching if your sport requires this type of movement.

Complex training – combines weight training and plyometrics in the same training program.

4 Exercise Variables in Plyometrics Training

1. **Intensity** – Is the effort involved in performing a given task. Intensity can be increased by: adding light weights, raising the platform, or covering a greater distance in longitudinal jumps.
2. **Volume** – Is the total work performed in a single workout session or cycle. Volume is often measured by counting foot contacts.
3. **Frequency** – Is the number of times an exercise is performed (repetitions) as well as the number of times exercise sessions take place in a training cycle. You should have at least 48 hours of recovery between plyometrics sessions.
4. **Recovery** – For power training, longer recovery periods (45-60 seconds) between sets of multiple events. A work to rest ratio of 1:5 to 1:10 should be used. Example: if an exercise takes 20 seconds to do, 100-200 seconds of recovery should be allowed.

Plyometrics training is anaerobic.

OTHER IMPORTANT FACTS:

1. You must develop a solid core (abs, gluts hips, and lower back), because this is what transfers the force into the ground.
2. The objective of strength training is better muscle recruitment, not creating more mass.
3. You want to increase your power output while maintaining your body weight.
4. Moving the body mass with greater efficiency leads to greater speed.
5. You must train according to energy systems. If your sport is explosive use explosive training.
6. Going from slow muscles to fast muscles requires performing quick explosive movement with minimum contact with the ground.
7. You must train at maximum speeds to get faster. Train fast to be fast.
8. Machines do not involve the stability required of free weight training, and there is also less strength transfer from using machines.
9. Anything that makes a muscle work harder can be classified as resistance training. (surgical tubing medicine balls, own body weight).
10. You should be concerned with quality, not quality.
11. The more varied the workout, the less chance the body has to adapt to any one way of training. This is the key in building speed and thus power.
12. You are born with a predetermined number of slow and fast twitch fibers types. While you cannot change these, you can train them to behave like the opposite type.
Sources: