

THE ULTIMATE IN SPEED

By Randy Huntington

This is an article about speed. Not quickness, not agility, but running forward, from Point A to Point B, as fast as you can. Pure, straight, unadulterated speed.

SPEED = DISTANCE X TIME

To determine an athlete's speed, there are various devices available that can measure the athlete's speed at each of the phases of the athlete's running motion. Brower Timing Systems, in Draper, Utah (Phone No.: 801-572-5540), and M/F Athletic Company, in Cranston, R.I. (Phone No.: 800-556-7464), both make Speedtrap timing devices that will measure your athlete's speed. These portable, easy-to-assemble, radio-controlled timing systems are accurate to 1/100th of a second and can ensure accurate starts, intermediate splits, and finishes.

There are three basic physical components that determine an athlete's speed: the metabolic systems, the biomechanical efficiency, and the neurological efficiency during the running motion. In this article, I will address the biomechanical and metabolic aspect of running and provide examples of training devices that can be used to improve an athlete's speed.

When examining the mechanics of the running movement, there are two components that govern the ability of an athlete and his or her coach to improve running speed: stride length



and stride frequency. Stride length deals with the athlete's biomechanical efficiency; whereas, stride frequency is determined by that athlete's metabolic makeup.

Both stride length and stride frequency can be measured during a "flying" 10-meter sprint. This gives the athlete a distance short enough to fully exploit his or her abilities in stride length and stride frequency. To measure these variables, the athlete lines up at approximately 20 to 30 meters from the start of the 10-meter "measuring zone" and sprints at full capacity through that zone. By measuring the athlete's speed in this way, you can ascertain the number of strides that take place through the zone and determine his or her stride frequency based on the time that elapsed. You can then arrive at stride length by measuring the distance between touch-downs (i.e., when the foot first touches the running surface

to the point when the other foot touches the running surface). A rough measurement can be calculated by placing a stride length measurement stick in the zone or by wetting the bottoms of the athlete's shoes and then measuring the distance between the footsteps. A very precise measurement can be calculated by laying down a tape measure in the zone, videotaping the athlete running, and then hand-timing the athlete's strides off the videotape. (Note: Make sure to measure stride length on both halves of the running stride; there is often a discrepancy on different sides of the body, which you may have to correct.)

It's very important to measure both stride length and stride frequency both at the beginning of a speed-training program and then at various stages during the program. These measurements will give you a basis for evaluating the training program's effectiveness for improving your athlete's speed.

THE BIOMECHANICAL COMPONENTS OF THE STRIDE

The mechanics of the running stride can be broken into three basic areas of concentration that relate to the improvement of running efficiency: frontside/attack mechanics; backside/recovery mechanics; and the mechanics associated with the foot touch-down through toe push-off, which is also known as the support phase.

The frontside/attack mechanics are those movements that occur in front of the body following leg recovery. Typically, frontside/attack mechanics start with the use of the hip flexors to complete knee-lift, through the downward drive of the thigh and to the active pawing motion that occurs just prior to touch-down. Backside/recovery mechanics are those movements that occur after push-off into lower leg recovery, through the pulling of the thigh to the very beginning of the knee-lift—which is the start of the attack phase.

There are a number of fine publications and videotapes available that I have found that can be used to help identify and resolve the problem areas in running mechanics. They are as follows:

◆ “Strength and Conditioning for Speed Development: A Coach’s Guide” is a collection of articles from the National Strength/Conditioning Association, in Lincoln, Neb., that contains information on speed development training. Phone No.: 402-472-3000

◆ Imported Publications, in Chicago, Ill., produces books on the techniques of Track & Field and circuit training. Phone No.: 312-378-7713 or 312-787-9017

◆ “Sportspeed,” by George Dintiman and Robert Ward, which is available from Human Kinetics Publishers, in Champaign, Ill., outlines a seven-step model to help athletes develop the ability to run faster and last longer. Phone No.: 800-747-4457

◆ “Acceleration: An Illustrated Guide,” by Randy Smythe, which is available through Speed City, in Portland, Ore., provides the most recent theories, techniques, and training tips to improve the accelerative, “first gear” of sprinting. The publication focuses on flexibility,

conditioning rules, mental preparation, and relaxation. Phone No.: 800-255-9930

◆ A videotape instructional series on sprinting and hurdling is offered by Speed Dynamics, in Cleveland. Each of the four, hour-long presentations



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are hosted by internationally recognized coaches Loren Seagrave and Kevin O’Donnell. The video series provides unmatched instruction, demonstrations performed by world-class athletes, and dozens of drills and specific training routines that are proven to optimize performance. Phone No.: 800-732-5503

◆ Bill Dellinger’s sprint technique videotape, which is available from Westcom Productions, in Eugene, Ore., details drills that can be used to

attain proper form for all race stages. The video’s emphasis is on leg speed, stride length, and arm action. Phone No.: 503-683-2236

◆ Carl Lewis and Coach Tom Tellez’s videotape, available from M/F Athletic Company, offers step-by-step instruction of all the techniques, principles, and training that have gone into Lewis’ development as a 100- and 200-meter sprinter. Phone No.: 800-556-7464

◆ Randy Smythe’s Speedbuilding™ videotape, available from Speed City, diagrams Smythe’s Specific Power, Overspeed, Flexibility, Acceleration, Stride, and Technique (SO FAST) method of improving speed with routines to be performed daily and weekly. Phone No.: 800-255-9930

DEVICES USED FOR IMPROVING STRIDE LENGTH

Loading, or adding resistance to the running movement, is a valuable training technique for improving the stride length component of speed. The following areas are most helped by resistance training:

Frontside/Attack Mechanics:

- Driving the thigh downward
- Activating the pawing action

Backside/Recovery Mechanics:

- Activating the hamstring
- Using hip flexor action/reaction

Touch-down/Support:

- Calf complex reaction
- Leg drive—power of hip extension in push-off

There are two categories of loading: those that have a horizontal emphasis

and those that have a vertical emphasis, with both creating greater impact forces to which the athlete must adapt. Horizontal loading is when resistance is added to the running movement, such as when an athlete pulls a sled. Vertical loading is when weight or force is added to the athlete's body, such as when he or she wears wrist weights or power pants, or when plyometrics are used (including medicine ball throws).

It's important to note that while horizontal and vertical loading are extremely valuable tools, they should not be considered strength-training programs (see the Strength-Training Devices Section in this article). In loading, the athlete is performing the running movement or some form of it, and the concentration is on the movement as opposed to building strength. It is critical for the athlete to build the necessary strength base prior to beginning loading as a technique to improve stride length.

Running or working out in water is another excellent form of loading that I have used with my athletes. While the athlete may be decreasing the gravitational load on his or her body as far as vertical loading is concerned, water workouts also provide certain strength-training benefits, as they create a greater load on muscle areas such as the hip flexors. In addition, water workouts can be used for recovery/restoration purposes (see the Recovery & Restoration Section in this article).

DEVICES USED FOR ADDING LOADED RESISTANCE

- ◆ The Speed Chute, available from FuturePRO, in Knoxville, Tenn., is a compact, lightweight, Soviet training device designed to improve running technique. The Chute helps develop better start acceleration and speed endurance, as well as maximum speed and power. Phone No.: 800-321-6975
- ◆ The Canvas Weight Vest, from M/F Athletic Company, features eight pockets, each holding a removable weight (1 1/4 lb. each). Additional weights can increase the weight of the vest to 20 lbs. Phone No.: (800) 556-7464
- ◆ Hand-held or foot-worn aquatic exercise equipment, from Hydro-Tone International, in Oklahoma City, Okla., is designed to dramatically increase the resistance of water along all planes of movement. Phone No.: 800-622-8663
- ◆ The Waterpower Workout®, available from Huey's Athletic Network, in Santa Monica, Calif., combines leaps, kicks, arm swings, sprints, and vertical jumps with rhythmic exercises for specific muscle groups to provide both cardiovascular and muscle-strength conditioning. Phone No.: 213-829-5622
- ◆ "Jumping Into Plyometrics," written by Dr. Don Chu and available from Leisure Press, explains basic muscle physiology, how plyometrics works, and how to design the ideal plyometric training program for your sport. It also diagrams various plyometric exercises, including those exercises that use medicine balls. Phone No.: 800-747-4457
- ◆ "Plyometrics: Explosive Power Training," a videotape by James C. Radcliffe and Robert C. Farentinos, offers descriptions and illustrations of plyometric exercises for nearly every sport and every part of the body. Phone No.: 800-747-4457
- ◆ Several devices are available from Speed City. The SprintResistor™ lets the athlete wear a padded vest while another person pulls a resistance rope that is attached to the back of the vest and serves to restrain the athlete. The Sprinter's Sled™ allows an athlete who is wearing the SprintResistor™ vest to pull a weight-

adjustable sled instead of another person (substituting a tire for a sled is a viable economic alternative). This exercise develops arm swing power while building sprinting strength. "Plyometrics: An Illustrated Guide" presents current theory, effective drills, and tips on what to do, what not to do, and how to map out plans for plyometric training. Welded steel frame Plyo Boxes™ are jumping boxes that can be incorporated into any plyometric training program. Three different size boxes are available. Phone No.: 800-255-9930

THE METABOLIC COMPONENTS OF STRIDE

While there are limitations on how much an athlete can improve in stride frequency, an athlete's stride frequency can be optimized, and in the course of preparing workouts for increasing speed, stride frequency should be emphasized prior to focusing on stride length. But the greatest changes in improving an athlete's speed will come through an increase in stride length, and you must be very careful in analyzing optimum stride frequency versus optimum stride length because there is an inverse relationship between the two.

Stride frequency can be improved only by performing workouts that are faster than those that the athlete is capable of doing on his or her own. By performing such workouts, you challenge the athlete's nervous system to adapt to a new stress—"overspeed." Such workouts include: running downhill at a two to three degree slope; using several different types of pulling devices, from elastic bands to pulleys to even motorized pulling systems where you can select the speed at which you wish the athlete to move; and running totally unloaded in the air (e.g., hanging from a bar and then moving your legs in the running motion as fast as possible).

DEVICES USED TO IMPROVE STRIDE FREQUENCY:

◆ The Speedbuilder™ vest, offered by Speed City, is worn by the athlete, and the flexicord attaches to the vest and another object, pulling the athlete for a faster run. The FastLeg™, also from Speed City, uses ankle harness and flexicord to increase hamstring, calf, quadricep and abdominal muscles and develop better push-off from the ground. Phone No.: 800-255-9930

◆ Elastic cord pulling and running downhill are also valuable techniques for improving stride frequency. In using these two techniques, the athlete is running faster than his or her usual pace. Therefore, the athlete is training his or her nervous system to function more efficiently while running at a higher speed.

In addition to using loading and speed-assistance devices to improve speed, I feel that it is also important to integrate unloaded techniques (i.e., a sequence of running drills) into speed training. These drills should be performed as part of the athlete's regular workouts. Many of the books and videotapes listed earlier in this article provide information on the types of drills that could be performed.

OTHER AREAS AFFECTING SPEED DEVELOPMENT

DEVICES USED FOR STRENGTH-TRAINING:

I feel that the two most important reasons for strength-training, in order of importance, are: 1) to reduce injury potential; and 2) to enhance performance. There are numerous types of strength-training equipment on the market, however, I feel that it is important in resistance-training to achieve maximum strength, but it is more important to achieve maximum power, which is defined as force x velocity. Therefore, when using weight-training to improve speed, it's

important for the athlete to move the weight/resistance force as fast as he or she is capable of doing so. Higher speed of movement means increased intensity.

The speed of movement in strength-training should be determined by the level of resistance that you choose—the lower the resistance, the faster you will move; the higher the resistance, the slower you will move. When using a strength-training machine that features a weight stack, you have to move at one speed, regardless of the resistance, to maintain a consistent strength curve. Thus, I feel that you will never achieve the same intensity and power with a weight stack that you will with a machine that features air resistance. With air resistance, there is a consistent strength curve at all training speeds.

I have found that the following equipment has been useful in improving strength-training:

◆ Air-powered exercise equipment, available from Keiser Sports Health Equipment, in Fresno, Calif., does not involve any inertial loading, thus putting less stress on the joints and more stress on the athlete's muscles. The equipment allows the athlete to control the resistance while executing the movement, and to move the resistance at the highest speed possible without incurring any risk of injury. Phone No.: 800-888-7009

◆ A 2-pound weight device, available from Lifeline USA, in Madison, Wis., creates a portable gym that provides a full-body workout and converts into a complete rehabilitation system. Phone No.: 800-553-6633

FLUID & NUTRIENT SUPPLEMENTATION

This can be a confusing area for those who are involved in improving the speed of athletes—there are so many claims made by so many

manufacturers that it seems you need a Ph.D. in biochemistry to figure out what supplements are best for your athletes. However, the area is being simplified more and more each day as research on the nutritional needs of athletes continues to occur.

You can properly evaluate this area by studying the diets of your athletes. During one week, write down all food and drinks that the athlete consumes. Then, using a guide that lists the nutritional breakdown of all foods, figure out if the athlete is deficient in any area. If a problem is discovered, you should alter the components of the athlete's diet to ensure that the individual is receiving the proper amounts of carbohydrates, fats, proteins, fluids, vitamins, and minerals.

In some cases, it may be important for athletes to take additional food and liquid nutrient supplements. There are many good supplements to choose from; the best advice is to consult with a sports nutritionist in order to ensure the proper nutrient intake.

I suggest that the following supplements should be considered:

◆ PowerBar, available from PowerFood, Inc., in Berkeley, Calif., is a healthful source of sustained energy made without oils or added fats. Flavors include Malt-Nut, Chocolate, and Wild Berry. Phone No.: 510-843-1330

◆ Nutritional supplements from Stim-O-Stam® in Mandeville, La., include four products that are based on a phosphate complex: the X-TRNR sports bar, which enhances all the body's systems, inhibits breakdown of lean muscle tissue, and accelerates recovery; STAM-ADE low-calorie fluid replacement drink; COACH'S CHOICE high-performance drink; and Stim-O-Stam tablets. Phone No.: 800-562-7514

◆ Nutritional supplements available from the Gatorade Sports Performance System, in Chicago, include: Gatorade®, a sport drink that rapidly replaces fluids and electrolytes and provides carbohydrates; GatorLode®, a carbohydrate drink mix that helps build glycogen storage; and GatorPro®, a supplement to an athlete's diet that provides vitamins, minerals, and carbohydrates, as well as high-quality protein. Phone No.: 312-222-6463

◆ Dextro Energy® products from In-Sports, Inc., in Burnsville, Minn., include Dextro Energy® Tablets, Orange Juice Drink, and Cereal Bars that are designed to absorb quickly into the blood stream to supplement or replenish the body's glucose supply. Phone No.: 612-890-0951.

RECOVERY & RESTORATION

Because athletes must train hard to improve their speed, it's important to include ways for the body to recover between exercise segments. There are four basic types of recovery techniques: 1) Electrical Therapy; 2) Mechanical Therapy; 3) Hydrotherapy; and 4) Physiological Therapy. Many speed-training professionals view these techniques as rehabilitative systems to be implemented after an injury has occurred. However, these techniques are equally as valuable as injury-prevention methods. Therefore, I feel that recovery and restoration techniques should be included as part of every workout. For more information on these recovery techniques, consult with athletic trainers and sports physical therapist.

CONCLUSION

While this article is an oversimplified view of how to improve your athlete's speed, hopefully I have wet your appetite enough to conduct research on this subject. I encourage you to seek out these devices because many of them have been extremely critical to the success of my athletes.◆

Randy Huntington has trained some of the finest athletes in the world, including world record holder Mike Powell, triple jump world-record-holder Willie Banks, Los Angeles Kings star Wayne Gretzky, Los Angeles Dodgers catcher Gary Carter, pro tennis players Michael Chang and Stephanie Rehe, and Chicago Bears offensive linemen Jay Hilgenberg. Huntington has also served as an assistant track and field coach at the University of Oregon, where he coached the sprints, hurdles, and jumps.

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