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Speed Development

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Sprinting is a skill. It is beautiful, violent, functional, and potentially destructive if conducted in an unsafe manner. It can bring glory to an athlete or be a factor in the survival and success of a warrior on the battlefield. At its simplest, it is a means of getting the body from one point to another in the shortest possible time, yet it is also a very complex, specialized motor skill that requires a high degree of coordination. Broken down into its fundamental components, it can be thought of as repetitive maximal force efforts; as such, it clearly exposes any muscular imbalances that exist in an athlete.

Defining the needs

CrossFit embraces ten physical abilities that define optimal fitness. When examining efficient sprinting, we need to test this activity against the demands of these abilities. Obviously, it is about speed. However, the other nine abilities also play a role in sprinting, especially when it is considered as a component of the CrossFit training model.

Individual sprints may not require cardiovascular endurance, yet repeated bouts of sprinting with short recoveries will have a dramatic effect on the body's ability to utilize oxidative processes. In short, the waste products of high-speed running (hydrogen, carbon dioxide, and lactate) will be relieved only by the body's ability to aerobically cycle this waste out of the system. Stamina will be tested by sprinting, so continual bouts of sprinting can improve the athlete's ability to process, deliver, store, and utilize energy.

Sprinting requires a great deal of strength, because force needs to be applied from leg to leg to accelerate the body. Strength is also necessary to stabilize the muscles of the leg so that force application is powerful and not chaotic. Insufficient strength and/or muscular imbalances often lead to dramatic and serious injuries. Efficient and powerful running requires a great deal of dynamic flexibility, which cannot be acquired through static stretching. (In a future article, we will discuss a protocol that can be used to develop this type of flexibility.) Power is definitely required and developed through sprinting. Many exercises, skills, or sports express power in two-footed movements, but sprinting is continual power movements in a single support. Speed occurs as we cycle through those movements and work to generate maximal velocity.

Coordination, agility, balance, and accuracy all have a role in the performance of an efficient and powerful sprint stride. A world-class 100-meter sprinter will have a rhythmic quality to their running pattern that is developed after constant rehearsal of their mechanics. Arm swings, leg cycles, and postural position require coordination, or the results will be either comical or horrendous. The sprint stride requires a great deal of agility, especially in the transition from starting (acceleration) mechanics to a full-out (maximal) run. Balance is required with each stride, because force is transferred each time the runner interacts with the ground. Great sprinters have an uncanny ability to place each foot in a near-perfect position as it relates to their center of gravity, whether it is at the start of a race or when they have achieved their maximum velocity. Even accuracy can be necessary, in that the athlete needs to control their movement to apply a force in an optimal direction. If the athlete does not have proper body control, then contortions can occur that affect their ability to move forward as fast as possible.

Terminology

When discussing sprint/speed training, there needs to be some common terminology to help to describe the qualities that we hope to achieve. Velocity describes the rate of motion in a given direction, often expressed as distance/time (e.g., miles per hour or meters per second). Acceleration describes the rate of change of velocity, and force is the effect one body has upon another. In sprinting, this can be thought of as the human body acting against the ground. Energy describes the capacity to do work, expressed in the formula force × distance. Power is the force against the ground required to move the body forward in a given amount of time (work/time). Stride length (the distance covered in one running step) and stride frequency (the speed of the legs, or the number of steps per second) are typically understood as the two variables that need to be increased to improve running speed.

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Physiological requirements for sprinting

Sprinting is predominantly an anaerobic activity, dependent mostly on the utilization of the ATP-CP energy system. Traditional long slow jogging tends to hamper the development of this energy system. As in weightlifting, the first 2 to 3 seconds of energy expenditure are "free," in the sense that no waste product is being generated. Running/lifting bouts of 6 to 7 seconds place heavy demands on ATP and require resynthesis of ATP-CP. This anaerobic alactic energy system is the rocket fuel that we want to tap into; however, it will only last about 7 seconds each time. Traditional track and field training of this energy system (anaerobic alatic) consists of successive runs of 30 to 60 meters with 1:30 to 3:00 rest between runs. Emphasis is placed each time on purposeful and explosive strides. In the three minutes following a 30- to 60-meter training bout, the ATP energy stores are replenished up to 95 to 98% of the pre-bout level, and CP are replenished to around 75%. The body will develop adaptations to effectively use this energy system for the greatest possible gains.

Sprint training also produces other adaptations that are not metabolic in nature: strength gains, muscular and neural recruitment processes, and synchronization and coordination of the efficiency of movement. Training at maximal effort (speed) will improve your skill and your coordination for performing at higher intensities through the full spectrum energy pathways and types of movements. Traditional aerobic training has no effect on buffer potential, and will hinder the development of these critical non-metabolic adaptations. As with all physical adaptations to exercise, the changes depend on the nature and intensity of the exercise performed. So the muscle buffering capacity is related to the effort put forth. Over an eight-week training period, an increase of 15 to 50% of muscle buffering capacity can occur, depending on the training age and condition of the athlete. Training at high intensity will help the individual economize their use of the supply of energy within the muscles.

Ways to begin development

In future articles we will lay out techniques that can be utilized to improve running mechanics and energy system recruitment and prevent injury, and we will provide further explanation of drills and activities that can be used every day to improve your athletes' performances. As a starting point, work to increase stride length and stride frequency. Increased stride length comes from improved flexibility and strength. A common functional tactic is to incorporate resistance running, either with

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sled pulling or hill running. Stride frequency is best developed by maximal-speed running. Emphasis should be on good posture and efficient mechanics: the head is neutral and relaxed; the shoulders and pelvis stay in alignment with each other; and each foot is placed squarely beneath the center of gravity. Try incorporating skill runs into workout days. For example, you might do something like the following to add speed development work to some recent WODs:

Day 1

Hill runs: 5 runs of 50-60 meters

15-12-9-6-3-rep rounds for total time of:

185-pound deadlift

Handstand push-ups

Vertical leap, 1 foot above reach

Day 2

Maximal-speed runs: 6-8 runs of 50-60 meters

Clean and jerk 1-1-1-1-1-1-1-1-1-1 reps

You do not have to be a highly gifted athlete or sprinting specialist to see improvement in sprinting. Moreover, developing your speed running and improving your sprinting skill can lead to marked advances in other skills necessary for high-level athletic performance.

Sources of Additional Information

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