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2011 Soccer Event Calendar Inside!

THE SHEIK PAYS AND FIFA LOVES IT | CANADIAN FUTSAL AT A CROSSROADS | THE VOYAGEURS CUP | SOCCERFIT-FACTS

SOCCER Fit-Facts

WHY DO TREADMILL TRAINING?

One of the highlights of our new services at the Soccer Fitness Training Centre is Treadmill Training, done on the revolutionary new Woodway Pro-XL high speed running treadmill. This article provides a background of traditional speed training, and a rationale for the science behind Soccer Fitness' Treadmill Training Protocols.

Traditionally, sprinting speed was thought of as the product of stride length (length either in time between ground contact of the feet, or distance covered by an individual's running strides) and stride frequency (total number of running strides performed in a given amount of time). Gains in stride length were associated with increased strength, specifically in the muscles used during sprinting, such as hip flexors, gluteals, quadriceps, hamstrings, and calves. Gains in stride frequency were associated with improvements in speed of muscle contractions, as well as mechanical efficiency, in the same muscle groups. If athletes wanted to run faster, the theory went, they needed to increase stride length, stride frequency, or both.

The inherent problem with this theory, however, is that increases in either stride length or stride frequency may not necessarily result in increased speed, because as one component increases, the other may decrease, and the net result in running speed may be the same. In fact, increasing speed has more to do with increasing an athlete's horizontal power output per unit of body mass, rather than simply improving stride length and/or stride frequency. These components will naturally accompany an increase in horizontal power output, and each individual athlete will find an optimal value for both stride length and stride frequency while running at their maximal speed.

Improvements in horizontal power output are associated with adopting proper coordination strategies that enable athletes to most efficiently transfer power generated by explosive contraction of the lower extremity, maximizing propulsive forces, and minimizing braking forces.

Improvements in horizontal power output, and thereby sprinting speed, can be accomplished by improvements in the following three areas of fitness: isometric muscular strength; static and dynamic flexibility; explosive power/ extension of the lower extremity (hip, knee, ankle).

Biomechanical analysis of sprinting reveals that there are five main phases that the lower extremity experiences during a sprint cycle:

1. Late Swing;
2. Foot Strike;
3. Braking/Support;
4. Propulsion;
5. Early Swing.

In addition to the five phases of sprinting in the lower extremity, three other biomechanical factors, relating to other parts of the body, will have an impact on overall running speed:

1. Pelvic orientation and stability;
2. Forward lean;
3. Arm swing.

Proper sprinting mechanics, during each of these five phases of sprinting, as well as these other three key factors for sprinting, are crucial for the development and maintenance of sprinting speed.

The Soccer Fitness Treadmill Training protocols were designed to aid the athlete in the following three areas of performance:

- Developing a coordination strategy and running style, which enables the athlete to maximize propulsive forces, and minimize breaking forces.
- Teaching proper total-body coordination and running mechanics for high speed and sprint running.

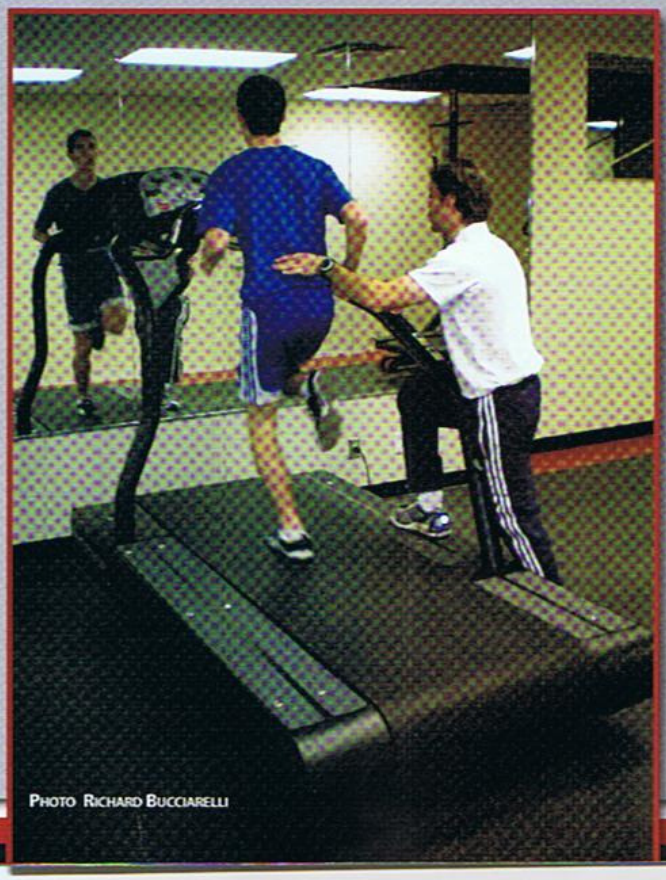

PHOTO RICHARD BUCCIARELLI

• Training and improving recovery between high intensity exercise, which has been shown to be the most important predictor of performance in soccer.

Treadmill training at Soccer Fitness is able to accomplish these goals through a unique combination of spotted level running and incline sprints, with closely controlled work-to-rest ratios.

The purpose of this section of the Training manual is to introduce and familiarize you with the science behind Treadmill training, as well as the specific procedures and protocols of Soccer Fitness' Treadmill training sessions.

Previously, the point was made that athletes wishing to improve running speed must adopt a coordination strategy that allows them to maximize propulsive forces and minimize braking forces. Incline running, whether on a treadmill (graded) or on the ground (up a hill), is an optimal way to achieve these two goals. During uphill running at high speed, the powerful extensor muscles in the lower extremity must produce a greater amount of force per stride to push the body upwards, maximizing propulsive forces. Stride length is increased, and proper sprint biomechanics, including a greater degree of hip flexion and more powerful hip extension, must be maintained in order to get "up the hill". Furthermore, braking forces in the lower extremity must be significantly reduced, in order to counteract the effect of gravity and ensure balance and stability while travelling forwards and upwards.

There is simply no better way for athletes to achieve the combination of maximal propulsive forces and minimal braking forces than incline running at high speed. The key to achieving these benefits, however, is that the incline running must be done at a high velocity. If the propulsive forces from extension movements in the lower extremity are carried out at lower velocities, the net resulting force will not be great enough for the athlete to "get up the hill" in a quick and efficient manner. It is in the achievement and maintenance of high velocity, and thereby more powerful propulsive forces, during incline running, where treadmill training holds the greatest advantage over ground-based running.

When running up a hill on the ground, the athlete must make a conscious effort to increase his or her speed, and furthermore must maintain a high speed regardless of fatigue. In a high intensity, repeated sprint workout, achieving and maintaining high speed with incline runs can become difficult or impossible. During incline running on the treadmill, however, athletes must achieve and maintain a high running speed, as set out by the protocol, during the entire duration of the sprint. Furthermore, the use of a trainer to spot the athlete during the run ensures that the athlete will be pushed just beyond his or her threshold for maintaining a particular speed and grade, leading to increased improvements in strength, speed and anaerobic endurance.

Treadmill running at higher speeds, both during incline and level running, also forces athletes to adopt total-body coordination patterns, which optimize movement efficiency, and thus improve running speed. As mentioned earlier, the athlete must maintain a certain running speed and is spotted by a trainer to ensure that they do so. This spotting will help the athlete to adjust and correct various aspects of running stride, including hip flexion and extension, proper foot positioning, proper pelvic positioning, and arm swing. In addition to having a trainer provide manual spotting, Soccer Fitness also uses Dartfish integrative video analysis software, so that all athletes are able to view themselves while they rest and receive optimal corrective feedback in the process.

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