

## SOCCER FIT-FACTS

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SPEED ENDURANCE TRAINING – THE KEY  
TO A SUCCESSFUL TRAINING CAMP

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In my role as Fitness Coach with the Canadian National Women's U17 team, I was recently tasked with planning the physical component of their 8-day training camp in November, 2011. Upon reviewing the camp schedule, I saw that the plans included 2 exhibition games, 2 inter-squad games, and 2 training sessions per day over the course of the week. Even in a short (8-day) training camp, a physical component of training is required, as they players must be able to continually improve their fitness each month in preparation for World Cup qualification matches in the spring of 2012. The main problem encountered when trying to plan fitness sessions is the lack of time allotted during each practice (15-20 minutes), as well as the high overall fatigue level of the players throughout the week. In order to effectively plan fitness training sessions that

provide adequate training load to the players, while minimizing the risks of overtraining and fatigue, I decided to use a relatively new and unique form of training, called speed endurance training.

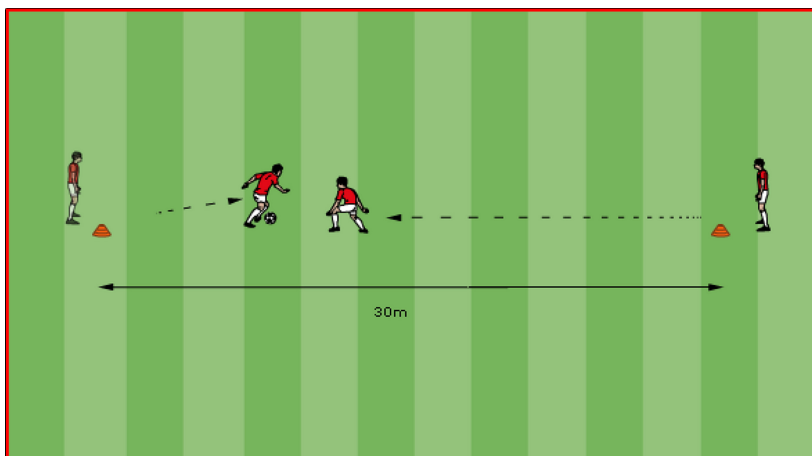
Speed endurance training involves performing 4-8 sets of 30-second exercise bouts, at an intensity between 80-90% of maximum, with a work-to-rest ratio of 1-6 (i.e. 30 seconds of work, 3 minutes of rest). Over the past 10 years, speed endurance exercises using this protocol, both without and with the ball, have been proven to be as, if not more, effective at improving players' overall endurance levels as more traditional continuous aerobic, and aerobic interval training. The main difference – and main advantage – of speed endurance training over the more traditional methods mentioned above is that speed endurance

training achieves the same results, with 1/3<sup>rd</sup> of the total training time. Whereas conventional workouts of continuous aerobic training can take 60 minutes or more to complete, the speed endurance protocol mentioned above, performed in small groups, can be completed in as little as 12 minutes (with a little as 2-3 minutes of actual training time). The significant reduction in total training time of up to 75% is most useful in training camps where practice time – and the players' level of energy – is limited. Furthermore, the ability to use the ball in these workouts adds a level of specificity which leads to better overall improvements in soccer skill, as well as aerobic fitness.

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## SOCCER-SPECIFIC ON-FIELD SPEED ENDURANCE TRAINING SESSIONS

### Speed Endurance: Passing/Receiving:



**Set-Up:** 3-4 stations, consisting of 2 red cones, placed 20m apart, with two white cones 3m inside them; stations include 4 players: 2 inside the station, without a ball, and 2 placed on the red cones, with a ball

**Activity:** players inside sprint, at 90-95% intensity, towards the outside cones; once they get inside the white cones, they must receive a pass from the outside and play a one-touch pass back to the outside player, then sprint to the opposite side for the next pass; players repeat this sequence for 30 seconds in total

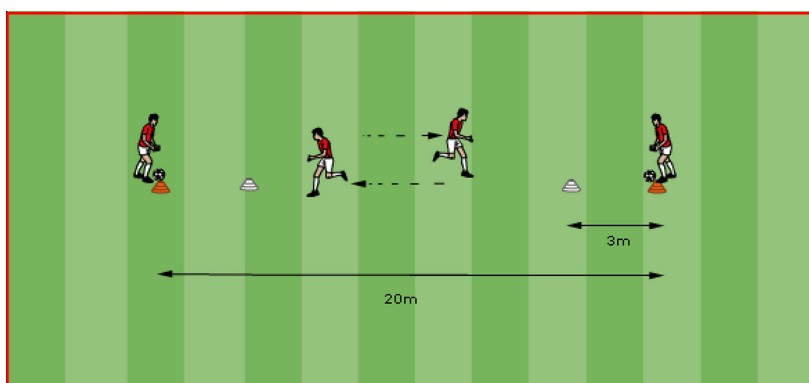
**Rest:** after the 30-second work period, inside players switch with the outside players, and the activity starts again; once both groups of players have performed one 30-second repetition, both groups will rest for another 2 minutes, and then the first group moves back to the inside for their second repetition

### Speed Endurance: Defensive Jockeying:

**Set-Up:** 3-4 stations, consisting of 2 red cones, placed 30m apart; stations include 4 players: 2 inside the station, one without a ball and one with a ball, and 2 placed on the red cones, without a ball

**Activity:** player inside, with a ball, plays a long pass to the player without the ball (30m away) and sprints at 95% intensity to close the player down in a defensive posture; the player with the ball dribbles diagonally and forwards (at 70% intensity), while the jockeying player moves backwards, for the entire 30 m distance; repetitions should take 30 seconds in total, with the next group of 2 players starting their activity once the first group finishes; players repeat the sequence in the opposite order (i.e. attackers become defenders, and defenders become attackers) in their next repetition

**Rest:** after the 30-second work period, inside players switch with the outside players, and the activity starts again



## PREPARING FOR COMPETITION AT ALTITUDE

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The final training camp for the Canadian National U17 Women's team in 2011 was in December, in Mexico City, Mexico. Training and competing in this location presented some unique challenges, due to the altitude (over 2000 metres above sea level), and pollution levels in the city. Both of these factors contribute to lower the amount of clean oxygen available to athletes while they are training and competing. In planning a training program for the players, I wanted to include some training exercises that would help prepare them physiologically to deal with the difficulties associated with exercising in these conditions. Before planning the actual sessions, however, it is important to learn and know the science behind altitude training, and how it relates specifically to the sport of soccer.

Soccer is an aerobic sport, which contains several short bursts of anaerobic activity throughout game play. What this means in terms of the energy requirement is that, during a soccer game, athletes are able to exercise in the presence of oxygen (aerobic activity), and normally only exercise without sufficient oxygen during specific short-duration moments of the game (short sprints and jumps, which are termed 'anaerobic' activities). A well trained soccer player will typically use their aerobic system to provide energy for the majority of the duration of a game, and will only 'switch' to their anaerobic system to provide energy during the specific short-duration movements mentioned above. Lactic acid, a painful byproduct of sustained anaerobic activity,

is typically not seen in high quantities in well-trained soccer players training and competing at sea level.

At altitude, because the partial pressure of oxygen in the air is lower than it is at sea level, there is less oxygen available to athletes while they train and compete. In soccer, athletes not accustomed to the high altitude environment will typically end up 'switching' to their anaerobic system much sooner during a game than they are typically accustomed to doing at sea level. Furthermore, every subsequent short-duration (anaerobic) activity will further increase the demand for oxygen (which may not be readily available) and thus the athlete will rely more and more on their anaerobic system throughout the game. The net result of this process is that athletes will accumulate higher quantities of lactic acid, which is the byproduct of sustained anaerobic activity, in their muscles. Once a sufficient amount of lactic acid accumulates in the muscles and is not removed, the athletes' performance will decrease as they will not be able to maintain the same work output.

In order to develop a training program to try to help prepare players for this increased demand on their anaerobic system, then, strength coaches must try to choose exercises and protocols that will replicate the increased amounts of lactic acid buildup experienced during playing soccer at altitude. The best type of training to stimulate this response is lactic acid tolerance training. This type of training

involves running at high intensity (85-100%) for a relatively long period of time (45-90 seconds), with work-to-rest periods of 1:5 to 1:10, and 4-6 total repetitions. The rationale for the 45-90 second, high intensity work period is that this type of work will produce a sufficient amount of lactic acid, even in well-trained soccer players. The rationale for the 1:5 to 1:10 work-to-rest ratio is that even with this amount of rest, athletes will not have fully cleared the lactic acid from their muscles that they produced from the previous work periods, so they will in effect be beginning the subsequent work periods with higher and higher concentrations of lactic acid. The training is termed "lactic acid tolerance" training because the athletes will eventually develop the ability to "tolerate" the higher amounts of lactic acid they produce in the sessions. This training adaptation is very effective and directly applicable to preparing athletes to train and compete at altitude. As mentioned earlier, in high altitude environments, athletes produce greater amounts of lactic acid, and they produce it sooner, than they normally do when training and competing at sea level. By stimulating this exact response in training, athletes develop both the ability to tolerate higher levels of lactic acid while exercising, as well as to clear lactic acid more quickly than they previously could. Both of these abilities have the end result of allowing athletes to maintain a higher work output during training and competition in high altitude environments.

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**"Strength coaches must choose exercises and protocols that will replicate the increased amounts of lactic acid buildup experienced during playing at altitude."**



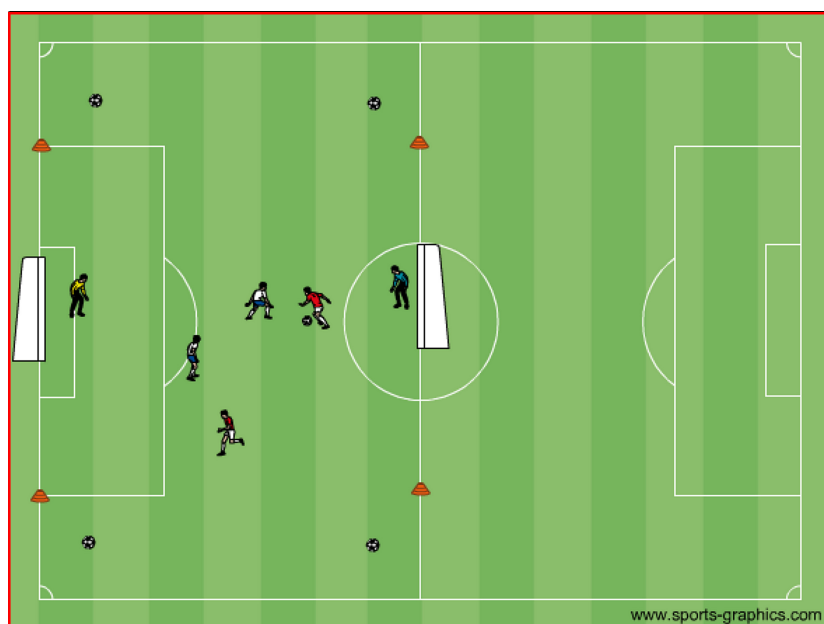
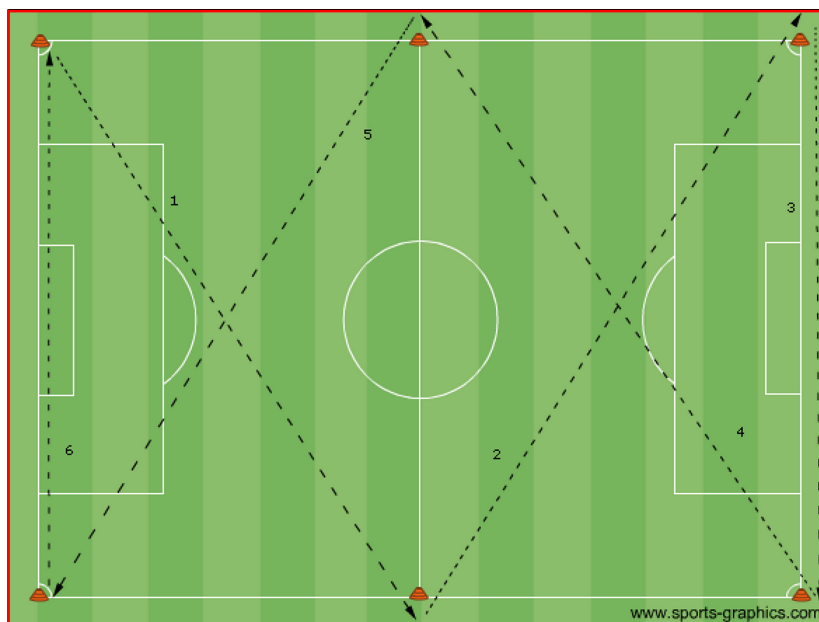
## SOCCER-SPECIFIC, ON-FIELD LACTIC ACID TOLERANCE TRAINING SESSIONS

### Lactic Acid Tolerance: 60-second diagonal sprint:

**Set-Up:** Start players in one corner of the field, with 4 cones placed on the corners of the field, and 1 placed at each corner of the half line.

**Activity:** Players sprint at 95-100% intensity, in a zig-zag pattern around the cones, as indicated in the diagram. There are 6 runs in total that will take them back to the starting point in the corner. The entire run should take approximately 60 seconds.

**Rest:** after the 60-second work period, players must rest for a total of 10 minutes. They should be very fatigued after the run, and will need the 10 minutes to recover in order to be able to perform the subsequent runs. Perform 4 runs of 60 seconds each, with 10 minutes rest between each run, to complete the workout.



### Lactic Acid Tolerance: 2 vs. 2 Game:

**Set-Up:** Players organized into groups/team of 2. Small fields set up inside 1 half of the field, as shown in the diagram. Goals with goalkeepers may be used, or alternatively, small goals without goalkeepers. Balls are stationed outside the playing area.

**Activity:** Teams play 2 vs. 2 game, for a total of 2.5 minutes. No rest or stoppages of the game are allowed. When a ball is out of play, another ball must immediately be played in by the coach or resting teams.

**Rest:** After the 2.5 minute work period, teams rest for 5 minutes, then play again. While 2 teams rest, other teams will play, and vice-versa. The intensity of the games should be very high (90-100%), so the players will need the recovery in between games. Perform a total of 4 games of 2 minutes each, with 5 minutes rest between games.



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