

Alex Ludwig

Michigan Rovers Director of Coaching

### **Aerobic endurance training improves soccer performance.**

U18 Soccer Team

**Purpose:** The aim of the present study was to study the effects of aerobic training on performance during soccer match and soccer specific tests.

**Methods:** Nineteen male elite junior soccer players, age 18.1 +/- 0.8 yr, randomly assigned to the training group (N = 9) and the control group (N = 10) participated in the study. The specific aerobic training consisted of interval training, four times 4 min at 90-95% of maximal heart rate, with a 3-min jog in between; twice per week for 8 wk. Players were monitored by video during two matches, one before and one after training.

**Results:** In the training group: a) maximal oxygen uptake ( $\dot{V}O_{2max}$ ) increased from 58.1 +/- 4.5 mL[kg<sup>-1</sup>min<sup>-1</sup>] to 64.3 +/- 3.9 mL[kg<sup>-1</sup>min<sup>-1</sup>] (P < 0.01); b) lactate threshold improved from 47.8 +/- 5.3 mL[kg<sup>-1</sup>min<sup>-1</sup>] to 55.4 +/- 4.1 mL[kg<sup>-1</sup>min<sup>-1</sup>] (P < 0.01); c) running economy was also improved by 6.7% (P < 0.05); d) distance covered during a match increased by 20% in the training group (P < 0.01); e) number of sprints increased by 100% (P < 0.01); f) number of involvements with the ball increased by 24% (P < 0.05); g) the average work intensity during a soccer match, measured as percent of maximal heart rate, was enhanced from 82.7 +/- 3.4% to 85.6 +/- 3.1% (P < 0.05); and h) no changes were found in maximal vertical jumping height, strength, speed, kicking velocity, kicking precision, or quality of passes after the training period. The control group showed no changes in any of the tested parameters.

**Conclusion:** Enhanced aerobic endurance in soccer players improved soccer performance by increasing the distance covered, enhancing work intensity, and increasing the number of sprints and involvements with the ball during a match.

### **What is fitness?**

There are different definitions of fitness actually means, but one common way it is described is as the 5 S's

- Speed
- Strength
- Stamina
- Suppleness -flexibility
- Skill

Two other S's sometimes associated with describing fitness are

- Specificity (what do you need to fit for)
- Spirit (psychological aspect)

One key element is specificity, in that what you want to be fit for, determines which of these S's has the most weight or importance. For example, a golfer would not need much speed but would need a lot of skill.

A 100m sprinter needs speed, strength, but not much stamina, a gymnast needs strength, skill, suppleness and stamina. However this stamina is different from the type of stamina that an endurance runner needs.

Team sports like soccer make it even harder to determine what areas of fitness are required. The types required will depend upon positions and role in the team, but one key area is skill and specificity. Soccer players should be soccer players first and athletes second. This doesn't mean that their athletic areas of fitness, speed, strength, stamina etc. are not important, because they are, but skill and specificity and perhaps spirit are the most important.

Having said that, a very skillful player who cannot last the whole match due to lack of stamina, or cannot get to the ball due to lack of speed, is not as useful to the team as the player who has slightly less skill, but more speed and stamina.

There are two specific types of stamina that we are interested in and these are aerobic and anaerobic.

### **Aerobic**

Aerobic fitness determines the level at which you can take in and use oxygen to perform an activity. An activity like walking doesn't put much stress on your body and most people can cope with this aerobic activity. Aerobic activities are activities like jogging, where you can continue without getting too tired. You work at a rate which means you don't get completely fatigued or out of breath. Aerobic training will increase the level at which this fatigue takes place, and will make your heart and lungs more efficient for exercise. You will be able to run further and faster before getting tired.

### **Anaerobic**

Anaerobic fitness determines the level at which you can work at a high intensity. This usually means short bursts of activity, where you will often be out of breath. You are working at a level where your body cannot provide enough oxygen and your muscles need to get energy from glycogen. You can only work for a short time at this level before you get too fatigued and go into something called "oxygen debt". An example of anaerobic exercise is sprinting. Anaerobic training will make your body more efficient at using glycogen as a stored fuel and also help it deal with oxygen debt. One effect of oxygen debt is the build up of lactic acid, which is felt when your legs for example, feel a burning sensation at the end of an intense long sprint. This lactic acid needs to be removed from muscles as quickly as possible and anaerobic training helps make your muscles more efficient at coping with lactic acid and better at removing waste products from muscles.

### **Soccer fitness**

Soccer players need a combination of aerobic and anaerobic fitness due to the nature of the game and the fact that there is continuous movement with lots of short bursts of more intense activity. Some positions require higher levels of anaerobic fitness than others, some require more aerobic fitness. A midfield player is required to cover a lot of ground during a game and needs a good aerobic engine. A striker on the other hand requires short bursts of repeated activity and requires more speed and anaerobic fitness.

One key aspect of fitness is to recognize is that each player is different and has different training requirements dependant upon their inherent physical abilities, their desire to train, age and position played. Soccer is a team sport and as such, players train together as a team. This is important for many reasons, but it also means that not all conditioning type sessions or activities have equal benefits across all players.

Where time is available to test and analyze results, it is much better if programs can be tailored for each player or group of players with the same requirements. I feel this is important from around the age of 13 and up, when the effects of training have much more of an impact. Conditioning and speed training at 10-13 years has less impact. A recent FA coaching report, suggested that players 10-12 benefit from training in that it prepares them physically and mentally for training when they are older. Their motor skills develop and they learn skills like how to run fast, as well as obvious ball skills when carrying out normal soccer skills training.

Once past puberty, speed endurance and strength, speed sessions will have more impact. Before that stage, sessions should not be too intense, involving shorter sessions with little emphasis on stamina. Ply metrics and strength building activities should be carried out with great care pre-puberty. Soccerfitness.net prefers to use low level strength and polymeric exercises with younger players, only to get techniques right, and prepare the body for more intense training when they get older.

At all times, however, speed and conditioning sessions are secondary to work done with the ball. Individual skills and team play are the key elements to successful, but having fitness can only make a good player better.

[programs](#)

**Pre-season**

**introduction**

These sessions are guides and as coaches you can either use them as outlined, or adapt them to follow your own requirements.

This initial phase 1 of the conditioning program is to develop the players' base fitness and the emphasis is therefore on aerobic fitness. These sessions should be used in the early stages of pre-season training. Some players may need to continue this type of session for later in pre-season, and sometimes during the season. These decisions will be based upon the results of their fitness tests, and the positions they play.

More strenuous sessions such as interval work, beach and hill sessions etc. will take place in later phases.

Speed and agility sessions, including emphasis on technique will take place nearer the start of the season.

For now, we want to get the players used to a proper warm up with good stretching and improve their aerobic fitness levels. To do this all sessions should provide approximately 15 to 20 minutes of continuous exercise.

Not all at one pace but with changes in effort and pace from fairly hard running to slow jog.

Unfortunately these aerobic sessions are probably the most boring part of training but they have to be done. All players should join in unless ill or injured and it may be interesting to note which players cope with this type of training more than others. I would expect midfield players to be better suited to this type of core fitness work, whereas some of the strikers and goalkeepers will struggle.

However, these sessions do also act as part of the team spirit and bonding of a team so although not so applicable to goalkeepers, they should be encouraged to take part, unless they are taking part in specialized goalkeeper training.

**examples**

All sessions should begin with:

- 5 min light jog
- 5 min stretching
- 5 min fast jog/easy run

Follow all conditioning sessions with some light jogging before they begin soccer specific sessions. Make sure you finish all sessions with slow jog and stretching.

**1 A**

**Pyramid Run**

Run for period, jog 30 seconds recovery

- 1, 2, 3, 2, 1
- 1, 2, 3, 3, 2, 1
- 1, 2, 3, 4, 3, 2, 1

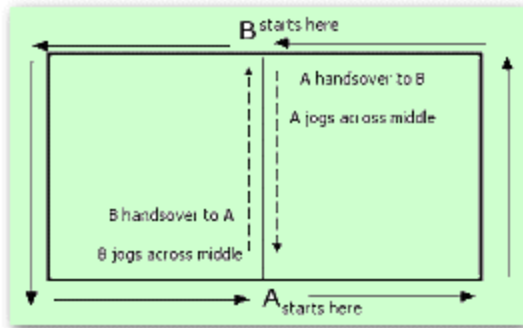
Run for 1 min, jog 30 seconds, run for 2 min, jog for 30 seconds etc.

No break - continuous running.

**1 B**

**Pair-run**

Divide players into groups of 2. Player A runs half a pitch and "handover" (touches) player B. Player B then runs the half of the pitch, while player A jogs across the middle in time to "handover" with player B.



- 10 minutes
- 12 minutes
- 15 minutes

**1 C**

**Fartlek**

Continuous running with a mixture of paces. I suggest blowing whistle to start effort phase, next blow of whistle is jog phase.

Split the runs into sections of 15, 30, 45, 60, 90 seconds runs with same time jog recovery.

Run around pitch so players know where to. Use the recovery jog phase to get all players together again.

For example:

- 15 seconds run, 15 seconds jog, 30 seconds run, 30 seconds jog...
- Work up to 90 seconds and then start at 15 seconds again.

Another example is that each player gets a turn at setting the pace and length of effort phase. This means that a

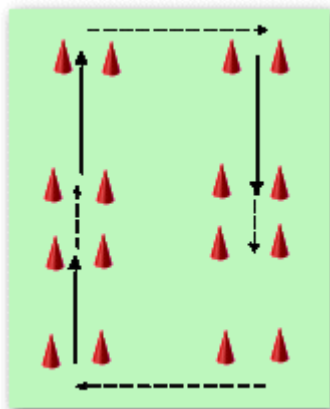
player can run very hard for 10 seconds, or run fairly hard for 2 min if they like. The other players have to keep up with him.

- 10 minutes
- 12 minutes
- 15 minutes

### 1 D

Intervals

Split pitches length into 3 sections – middle section about 20 meters.



Players run hard for first section, ease off middle section and then run hard 3rd section.

Jog across 30 meters and repeat.

- 4 circuits – 5 min jog – 4 circuits
- 5 circuits – 5 min jog – 5 circuits
- 6 circuits – 5 min jog – 6 circuits

### 1 E

Indian File ( 2 lines )

Players run in a single file, coach blows whistle and last player has to run hard to get to front.

If pace appears too slow, then blow whistle more frequently then if pace appears fast.

## programs

### speed sessions

#### introduction

These sessions are guides and can be used by coaches and players to help develop speed and agility. The sessions I run always start with technique drills that are supervised to ensure correct, relaxed technique, these drills are followed by a specific speed session.

The speed session could be very short but intense, working on explosive, high quality speed, or it could be aimed at more speed endurance, where the runs are a little longer, still intense with adequate recovery. At the start of the speed training, early season, the sessions are high quality, but not flat out, with walk/jog recovery.

Once the player has had a few weeks of this level of intensity, the quality of the sprints can increase to flat out effort with longer walk recovery. It is important that a player has adequate recovery to keep the intensity up when trying to develop speed. The sessions should also be done at the start of a soccer training session after a good warm-up, or as a session on their own. Do not do these sessions at the end of the training session and do not attempt them if muscles are sore or strained.

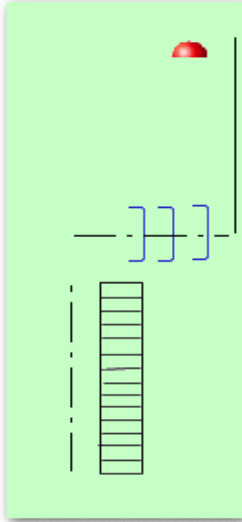
## examples

All sessions should begin with:

- 5 min light jog
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Follow all conditioning sessions with some light jogging before they begin soccer specific sessions. Make sure you finish all sessions with slow jog and stretching.

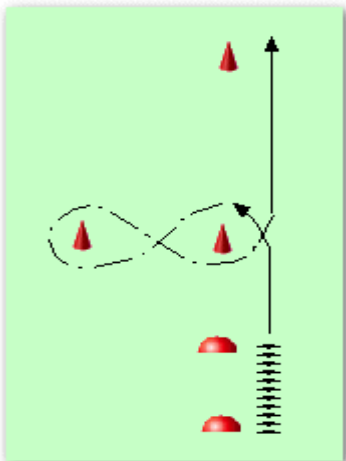
Most of these drills can be run as competitions by laying out multiple cone/ladder/hurdle combinations and having players run against each other. One caution with this is that when competing, players will often forget about technique. Use competition runs once you are happy with your player's technique, especially fast feet techniques over ladders and hurdles.



#### Fast Feet 1

Use a fast foot ladder technique (2 feet in each rung), then two foot step over each hurdle and sprint to cone.

Early part of speed training phase, do 6-8 runs with a fast walk/jog recover, later in speed training phase, do flat out runs, 2 sets of 4 - 6 runs.

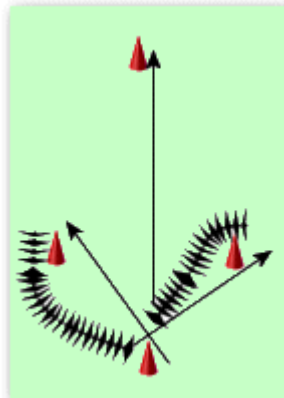


#### Agility

Start with a backwards run, sprint forwards at the second cone, at the first witch's hat, step side to side across to the other witches hat, around and back around the first witches hat, then sprint to the final cone.

For short, sharp speed work, place cones 2 to 5 meters apart, with 10 meters to the last cone.

Early part of speed training phase, do 6-8 runs with a fast walk/jog recover, later in speed training phase, do flat out runs, 2 sets of 4 - 6 runs.



#### Explosive Speed

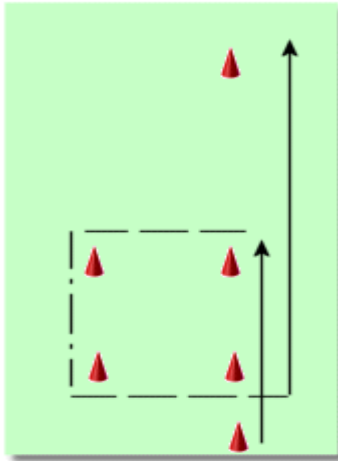
Sprint to the witches hat on left, go round and run backwards to starting cone, sprint to witches hat on right, go round and run backwards to starting cone, now sprint forwards to last cone.

Place left and right cones 2 to 3 meters away from start cone and last cone 5 to 10 meters from start cone.

Early part of speed training phase, do 6-8 runs with a fast walk/jog recover, later in speed training phase, do flat out runs, 2 sets of 4 - 6 runs.

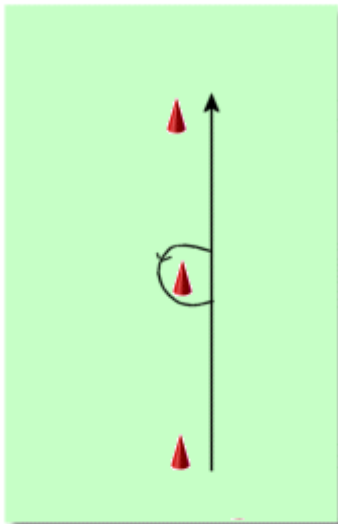
Speed and Agility 1

Start on first cone, sprint forwards to third cone, side to side left, run backwards, side to side right, then sprint to last cone. Should be facing forwards at all times. Aim is to keep close to cones and not run too wide, move quickly at all times.



Place start cone 2 to 3 meters away from cone square and place all other cones approximately 5 meters apart.

Early part of speed training phase, do 6-8 runs with a fast walk/jog recover, later in speed training phase, do flat out runs, 2 sets of 4 - 6 runs with a very slow jog recovery.



#### Speed and Agility 2

Start on first cone, sprint forwards to middle cone, go round the cone (facing forwards all the time), and accelerate to last cone.

Place cones approximately 10 to 15 meters apart.

Early part of speed training phase, do 6-8 runs with a fast walk/jog recover, later in speed training phase, do flat out runs, 2 sets of 4 - 6 runs with a very slow jog recovery.

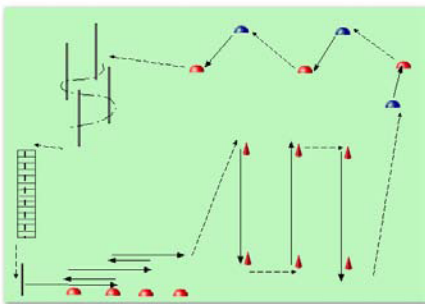
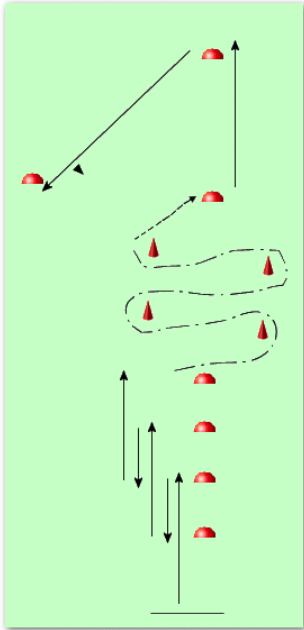
#### Wind Sprints

Place cones, 20 meters apart, allow players a slow run in, then fast sprints over 20 meters. Make sure players do not pull up sharply at the end of the sprint and allow time to slow down.

Early part of speed training phase, do 6-8 runs with a fast walk/jog recover, later in speed training phase, do flat out runs, 2 sets of 4 - 6 runs with a very slow jog recovery.

#### Speed Endurance

Shuttle runs through first set of cones (place approx. 10 meters apart). Then side to side round witch's hats jog to cone, sprint to last cone, then sharp turn and sprint to final cone. This is a hard session if quality kept up. Aim for 8 repetitions with jog recovery.



### Speed Circuit

Place cones around pitch or similar sized area, each station represents an area where the player works hard, then jogs to next station. It is important that the player works hard at each station; there should be distinct differences in effort between work done at a station and the jog recovery. Do not run too hard on the jog recovery as it will take away your ability to work hard at the next station.

At early part of speed endurance phase, (pre-season, or early season), aim for 5 min continuous run with 3 min walk recovery, repeat 3 times. During later stages of speed endurance phase, during season for example, aim for 3-4 min circuits, with 3 min recovery.

Alex Ludwig  
Michigan Rovers  
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