

## The Physical Demands of Soccer

Soccer is a game that places emphasis on a player's physical conditioning as well as a player's soccer skills. None of the major sports demand such a balance between aerobic fitness and sport-specific skills. But how much does the sport of soccer demand of a person's body when the game is played at the highest level? How much does a player run in the course of one 90-minute match?

Knowing how, and how far, a player runs in a soccer match is important for coaches and players to design their fitness programs. But determining how far a player runs is very difficult. First you have to videotape a game with a camera that doesn't follow the ball. Then play it back while you focus on one player, recording every movement they make while estimating the pace and distance they run. Then rewind and do it all over again for the next player.

The first season-long study was done on Everton FC (Liverpool, England) in the mid 1970s, and it was estimated that the distance covered by an average player was just less than 8800 meters. In the study, movement speeds were designated as walking, jogging, cruising ('running with manifest purpose and effort'), sprinting and backing. About 2/3 of the distance was covered at the low intensities of walking and jogging and around 800 meters sprinting in numerous short bursts of 10-40 meters. The study found that a player was in control of the ball for an average of 200 meters for a total of 90 seconds (that means a player spends 88.5 minutes trying to get or keep someone from getting the ball).

Dividing the total discrete movement by the total number of seconds in a game illustrates that there is a change of speed and direction every 5-6 seconds. More recent estimates have pushed this total distance to around 10,000 meters for a men's professional European game, with a little less distance covered over the course of an average South American. Midfielders run the most, and center forwards and defenders run the least. Covering 10,000 m (6 miles) in 90 minutes is an average of 4 mph, something a good power walker can do.

The intensity of the game can be estimated using a heart monitor you sometimes see joggers and cyclists wearing. The average heart rate for the full 90 minutes is between 150-170 beats per minute with very high values while sprinting and more moderate values when less involved in the game. One women's national team member was charted and averaged 185-190 beats per minute - for the whole game! The most physically intense part of the game is while you are in control of the ball, when your heart rate and lactic acid production (that heavy feeling in your legs you perceive after sprinting) both increase.

There are newer methods being used to make data collection less time consuming. Those conducting these types of studies are now using the global positioning system to track players during games/training. Players wear a cell

phone size GPS receiver and satellite signals are stored every 2 seconds. A little geometry is all that is needed to solve the total distance run.

Women's spring games (local universities and pro teams) in the Raleigh area were studied and the players charted. The average running distance was just over 8500 meters, but one highly competitive game (UNC vs. Raleigh Wings) had a couple women over 10,000 meters for the game. Generally, the women's game is a little less running and at a slower pace (about 75% of the women's game is at a walk/jog), but when conditions demand it, the women can cover just as much distance as the men. And, realize that women have a smaller physical capacity, so when they cover the same distance as men - playing the same game on the same field for the same time as men - they are working harder.

Regardless of the difference between men's and women's matches, the game of soccer is one that demands an incredible amount of fitness. Over the course of a 90-minute game, a player's skills, as well as his fitness, will be tested. The amount of running that a player does in one match is around six miles – and can be much more - and players need to be able to run nearly as hard in the 90th minute as they are able to run in the first minute. Just as a player would not neglect his soccer skills, a player should not neglect the physical fitness component of his/her training.