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Year Round Fitness Management for Soccer
Understanding the Paradigm Shift

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I was recently cornered by one of our fitness coach interns. Let's call her Susan. It was the end of the day and after she had completed a lengthy review of some reading materials I had given her, I could tell by the look on her face that she had questions and was looking for answers. "So explain to me what this all means", she said. "Why is soccer such a complex sport to train? Why is this all new to me? Why didn't I learn this in school?" A long list of questions followed one after the other. Then there was silence. As uncomfortable as it was, the silence was necessary as I spun the wheels trying to come up with adequate, all be it vague, answers that would buy me some time until I could come up with the real answers. That was yesterday (Friday). If things work out the way I've planned, by Monday she hopefully will have forgotten that she asked the questions entirely. But just in case she does not forget, I will have the following words for her.


Steve Tashjian

Susan's questions will require some elaborate answers. But first, let me clarify myself regarding the purpose and focus of this particular article. I want to make sure that the title of the article does not confuse anyone or lead anyone in a different direction than I intend. My focal point is not going to be the training of soccer athletes within the private setting. It will not apply to pre-pubescent athletes whose athletic needs are more movement development based rather than advanced fitness and skill level based. My focus instead, will be on high level youth players to elite professional players. The emphasis will be on the paradigm shift from the conventional method of fitness training for soccer to the modern movement in fitness training for soccer. I want to shift our attention from the one-on-one training mentality that functions in the private setting to the year round training mentality that takes place on the field, everyday, in the team setting. We will focus on the bigger picture that starts with the off-season and does not end until, hopefully, the post-season. Speaking from my experience in both the private and team settings, I can tell you that they are much different; presenting different challenges that require different skill sets in order to be successful. By the time this article is finished, we hopefully will have a better view of where we need to go as a profession and what we need to provide as instructors and facilitators to get us there.

Out of all the questions my intern Susan had for me, the one I want to address first is, "Why didn't I learn this in school?" As a whole, strength and conditioning coaches and instructors in the U.S. were not raised on soccer. Many played it as a youthful pastime but moved onto the more popular American sports as they began to reach the ages where they truly wanted to apply themselves to a sport they were passionate about. There is no better way to learn about a sport than by playing it. That has bread, in my opinion, a natural gravitation in the strength and conditioning world to a greater emphasis on the physical needs and specifics of training sports other than soccer.

As professional soccer has gained popularity in the U.S., we have seen many strength and conditioning organizations and publications making greater strides to include soccer specific training into their curriculum. Universities have spent more time focusing on the physiological demands of the sport which has resulted in a massive library of information that our finest research journals have been able to give to us. However, the reason why interns all over the country such as Susan, will continue to ask the question, "Why didn't I learn this in school", is because we do not have enough strength and conditioning coaches in the U.S. with the professional experience and knowledge necessary to teach our young strength and conditioning coaches how to apply the knowledge on the field. We have a plethora of educators with experience in the private setting training private clients who want to become better athletes, but we are deficient in educators with team training experience, especially in soccer. We are not experienced enough on the field to mentor young strength and conditioning coaches who have a passion for the sport of soccer.

However, here in the U.S., we are among the leaders in exercise physiology instruction. Each year I work with student interns from our finest local universities and their understanding of exercise physiology is impressive. But the instruction is heavily track and field and endurance sports based. As a consequence, most young strength and conditioning coaches approach soccer with a strong physiological understanding of energy system development, but a weak soccer specific understanding of energy system development. This is where the paradigm shift begins in understanding the modern movement in fitness training for soccer. It is a shift that moves us away from the conventional methods of energy system development which focuses on timed runs over distance at a certain % of HR max with very little to no change of direction or change of speed, to a more analytical application of physiology that manipulates the variables

within the game of soccer itself in order to achieve the desired training effect.

Soccer is a complex sport to train on a team level because success depends on the fitness coaches understanding of the physical demands of the sport. European countries have devoted a lot of resources to the art of match analysis and the results are a part of the curriculum used in the physiology departments of European universities. These match analysis programs utilize heart rate monitoring, video analysis and GPS to give researchers information on the movements performed by the players, the speed of those movements, and the distances covered by the players in a full 90 minute match. The data that these systems have accumulated over the years is massive. The content has filled entire text books. We will focus on a few key points to start to get the paradigm shift moving.

Work to rest is always a key ingredient in any training session. Soccer related fitness sessions are no different. However, the modern fitness movement in soccer handles energy system development much differently. In order to understand the modern method, we need a starting point. I always default back to a 90 minute soccer match. Most research from the UK, Holland, Sweden and Denmark report that on average, an elite professional soccer player will cover 9-12 kilometers (km) in a 90 minute match with some players covering as much as 15 km. But more important than the distances covered, is the method by which the distance is covered. Table 1 shows the distribution of the total distance covered through walking, jogging, running and sprinting. As we can see, the distance covered by walking and jogging, which can both be considered recovery modes, is a large percentage of the total distance covered. It starts to paint a picture for us regarding what is happening on the field. We have a sport with intermittent bouts of high intensity work followed by recovery.

Table 2 breaks things down further by showing us the average duration of each individual bout of activity. This data was collected while studying elite soccer players from the premier league in Denmark. From data such as this, researchers have calculated the average work to rest ratio of a full 90 minute soccer match. That ratio has been reported between 1:5 and 1:7, with the most current research supporting the latter. This data will help us later on when we talk about how to manipulate game situations to increase the intensity of soccer specific games in order to achieve a desired training effect.

Another physical demand is evident from this data as well. On average, a player will switch activities every 4-5 seconds. It gives us a very tangible understanding of how quickly players are required to change speed and change direction. When you combine the information from Table 2 with the data in Table 3, we can start to see that the soccer is a power game; one that requires a massive tolerance to acceleration, deceleration, and re-acceleration.

Hopefully the data can begin to explain the complexities of training soccer. Obviously the data shows that a high level of endurance is necessary in soccer with players covering anywhere between 9-12km. However, it also shows that aerobic training methods utilized in conventional endurance sports will not address the needed endurance to the change of speed and change of direction demands in soccer. Obvious as well, is the intermittent nature of soccer. But if we address this need with conventional 100, 200 and or 400 m intervals we will have failed to replicate the types of sprints or the type of distances soccer players cover. The conventional method of training soccer leaves a lot of questions to be answered. What do we do about the speed demands? How do we address the agility demands? What will our strength program look? Finally, the question that our head coach will ask, when are we going to work on playing soccer?

The modern fitness movement says that the answer is in the game itself. Now, I think all of you including Susan would be disappointed if I said that all soccer players need to do is play soccer. That is not what I am saying. I will say that the games they play are a significant part of it. Even more significant however, is the fitness coach's ability to create games and drills and exercises based on the nuances of the game to get the desired training affect.

We will begin next month with extensive fitness training. The modern fitness movements replacement for aerobic training. O

Position: Country	**Walking**	**Jogging**	**Running**	**Sprinting**	**Total Distance**
Defenders:					
Netherlands	3.2 km	2.0 km	1.4 km	1.4 km	8.4 km
England	2.2 km	4.6 km	0.6 km	0.1 km	9.0 km
Dutch U-18 Youth	3.0 km	2.5 km	1.2 km	0.9 km	8.0 km
Midfielders:					
Netherlands	2.6 km	5.2 km	1.8 km	1.4 km	10.9 km
England	2.8 km	7.0 km	0.8 km	0.1 km	12.1 km
Dutch U-18 Youth	1.9 km	5.9 km	1.2 km	0.9 km	10.7 km
Forwards:					
Netherlands	3.4 km	2.0 km	1.6 km	1.8 km	9.8 km
England	3.5 km	4.0 km	1.2 km	0.4 km	10.4 km
Dutch U-18 Youth	4.6 km	2.2 km	1.0 km	1.3 km	9.3 km

Table 1. The difference in distance covered by position in Kilometers (Km) on average. (Modified from Performance Conditioning Soccer, 1998, pg 12; Verheijen, Dr. Raymond; Reedswain Videos and Books.)

	Standing	Walking	Jogging	Low Speed	Backward	Mod Speed	High Speed	Sprint
Defenders	7.4 s	6.4 s	3.2 s	2.9 s	2.4 s	2.7 s	2.4 s	2.0 s
Midfielders	8.0 s	6.4 s	3.7 s	4.0 s	2.6 s	2.3 s	2.0 s	2.1 s
Forwards	7.7 s	7.4 s	3.2 s	3.3 s	7.5 s	2.5 s	2.0 s	1.7 s

Table 2. Average duration of the various soccer activities performed in a 90 minute soccer match from the Danish premier soccer league. (Modified from Fitness Training in Soccer: A Scientific Approach, 2003, pg 61; Bangsbo, Jens; Reedswain Publishing.)

	Total Sprint Distance	Total Number of Sprints	Sprints 1 - 5m	Sprints 6 - 10m	Sprints 11 - 20m	Sprints 21 - 30m	Sprints 31 - 40m	Sprints 40m +
Defenders								
Elite Players	1.4 km	162	83	47	18	8	4	2
U-18 Youth	0.9 km	101	54	24	12	6	3	3
Midfielders								
Elite Players	1.1 km	127	70	31	11	6	6	3
U-18 Youth	0.8 km	94	57	14	11	6	4	2
Forwards								
Elite Players	1.8 km	183	76	59	28	14	4	2
U-18 Youth	1.4 km	134	54	47	21	8	3	1

Table 3. Sprint data from the top league in the Netherlands and the elite U-18 youth teams. (Modified from Performance Conditioning Soccer, 1998, pg 10; Verheijen, Dr. Raymond; Reedswain Videos and Books.)