Developing Your Soccer Conditioning Program

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about the AUTHOR

Rob Taylor has been the Head Strength and Conditioning Coach at Loyola College in Maryland since the 2003 – 2004 athletic seasons. Rob is a graduate of Lock Haven University, where he was a three year starter for the baseball team. He has worked with professional organizations such as the Anaheim Angels, Tampa Bay Buccaneers, Tampa Bay Mutiny, and San Antonio Silver Stars.

When designing strength and conditioning programs appropriate for soccer, there are many components to consider. Sports nutrition, rest and recovery techniques, body composition education, performance flexibility routines, muscular strength/power components, agility/reaction training, skill/speed development, and cardiovascular fitness are just a few that make up a year round, comprehensive program. This article will focus on how we condition our soccer players at Loyola College in Maryland, how we utilize our heart rate training program, and how to help prepare athletes for the demands of game day.

The four primary conditioning methods that we utilize throughout the year are long, slow distance training (LSD), high-intensity continuous exercise (HICE), interval training, and special speed-endurance (SSE). There is controversy that exists as to which of these training methods results in the greatest improvement in VO_2max. We also overlap these training methods to help get the most out of our players. Depending on the time of year, one or all of these methodologies may be incorporated into their weekly regimen. Our players are continuously educated that they must train at a level of effort that will stimulate the body to make improvements. Once improvements have occurred, the work must become progressively harder to force further improvements. Therefore, our conditioning program is designed similarly to our strength program, where the focus is overload and progression.

Beginning in November at the end of most college soccer seasons, a group of athletes may be assigned to the LSD training group. Our LSD workouts involve exercises at low intensities (i.e., 70 – 80% of an athlete's maximum heart rate). The athlete will be responsible for completing up to two workouts per week that are normally greater in length than normal competition distance (i.e., 6 – 8 miles in most cases). Research suggests that this technique is inferior to short-term, high intensity exercise in improving VO_2max (14). However, the low intensity training helps our athletes to improve their body composition while recovering from a physically demanding season. Our progressive heart rate program gives the athlete the freedom to choose his or her own modality to achieve the weekly conditioning goal.

It used to be a common belief that an improvement in aerobic capacity, fitness, or endurance was proportional to the distance ran (a.k.a. volume). A common myth within the coaching field is that "more must be better." Costil and colleagues contradict this belief. In a study comparing a group that trained for 3 hours and another for 1.5, the results indicated that the 1.5 hour group performed as well as the 3 hour group. In fact, the 3 hour group performed more poorly than the 1.5 hour group in some events. Therefore, the volume of training required to reach the benefits associated with LSD needs to be considered (5).

The second phase of the conditioning program begins in January. Our HICE program is the second component that we expose our athletes to and is used from January through the end of the season. It is believed that training at 80 – 90%of VO_2max may be optimal for most athletes. Training at or slightly above the lactate threshold provides excellent improvement in maximum aerobic power and thus is a useful guideline for planning training programs (18).

By the end of March, our interval training program is introduced to the team. It is believed that high intensity intervals lasting longer than sixty seconds are more effective in improving aerobic power, and perhaps lactate threshold, than low intensity intervals (11). Multiple modalities are used throughout this program. Treadmills, climbers, and cranks are all used along with our running and swimming pool program.

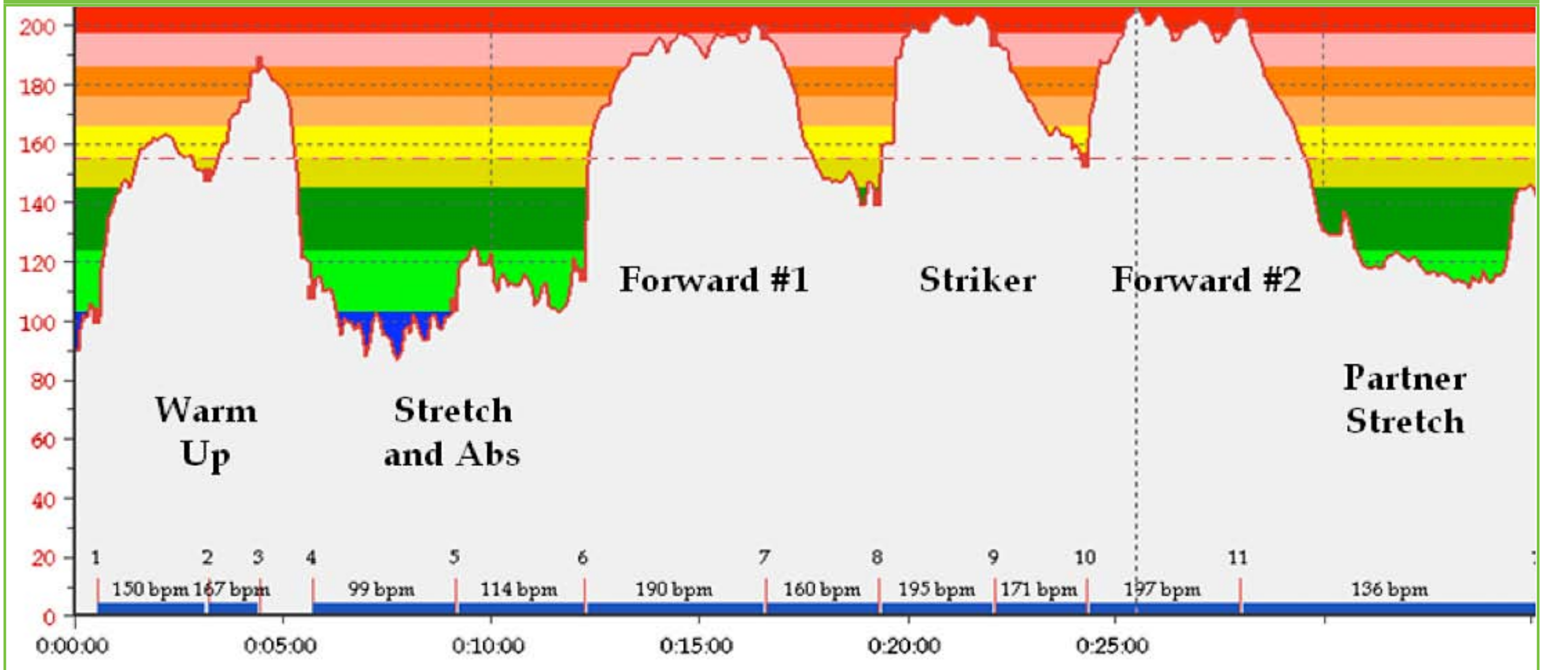

Fig1 Athlete's heart rate responding to our forward and striker workouts

The rest-to-work ratio in our conditioning programs is dictated initially by the time of year. As our programs approach the pre-season, we are looking for the athlete to be able to repeat high effort performances at full speed with limited-to-no mental breakdown. From January to March, we break into four groups and have a 3:1 rest-to-work ratio. From spring break through June, we use three groups or a 2:1 ratio. From July through pre-season, we ask the athletes to perform at a very high level with limited recovery and generally only use two groups (1:1).

A guideline similar to the rest-to-work ratio helps us identify individuals who need more or less attention. From January to March, the interval workouts are evaluated as a "success" if the athlete exceeds more than 80% of their maximum heart rate (MHR) during the work phase, and can recover to less than 70% during the rest period. From spring break through June, the expectation is moved up to 85% and 75% respectively. Then, from July through pre-season, we are trying to replicate the cardiovascular stress that the player will incur during a game. We use 90% during the work phase and 80% for our rest. During the season, we expect to have more than 80% of the total duration of our small sided games or fitness sessions spent above 80% of the athlete's MHR.

The final component to our conditioning program is our SSE program (a.k.a. simulated game), which is introduced to our team in June. This component duplicates the position-specific activities the athlete performs in competition. This program helps facilitate the transition from running in a straight line to performing the physical demands of each position. We ask that each sprint is run at full speed. The athletes are allowed to jog back to the starting point when and where appropriate. We use heart rate response and a stop watch to monitor progress. Our SSE program is broken up by position and the demands are tailored to how each individual plays the game. Our center backs are expected to make 80 or more high intensity runs, center midfielders more than 90, forwards 100 or more, outside backs greater than 120, and our outside midfielders over 140 in a typical workout prior to the start of the season. The distances of the runs can change due to position, game simulation, and formation responsibility within our system of play. We break up the number of runs into two halves to simulate a half-time break as well. See figure 1 (above) for an example of how an athlete's heart rate responds to our forward and striker workouts.

During a soccer game, an athlete will sprint for only a minor part of game time. But, sprinting accounts for a huge part of the physiological demands of soccer. The ability to recover from high intensity efforts is a significant factor in performance at the highest levels. Therefore, conditioning for soccer has to be appropriate for the game of soccer. The demands of running a series of sprints are different from running in a game situation (20).

In the beginning of researching how we were going to administer the four components we felt were necessary for our athletes to have a successful program available to them, we questioned how we would hold them accountable. With VO_2max testing taking time, money, and space, we felt that was not a feasible option. Athletes need a non-evasive means of evaluating exercise intensity that provides instant feedback.

For example, our HICE program is based on a study which recommends using an alternative to laboratory testing to determine lactate threshold. It indicates to have athletes train at a

Table 1

Defining Heart Rate Training Zones

Anaerobic Maximum	Improve anaerobic system, improve PCr and glycolytic pathways, and lactate threshold
Anaerobic Sub-Maximum	Initiate intermittent training, improve recovery abilities, and blood lactate metabolism
Aerobic Maximum	Improve aerobic system, increase oxidative capacity, and enhance intermittent training
Aerobic Sub-Maximum	Utilize fat mobilization, oxidative capacity, and improve running economy
Recovery	Clear waste products, and increase blood flow

fixed percentage of their MHR. Weltman and colleagues (21) suggest that if lactate threshold is to be used as the appropriate exercise training intensity for HICE, athletes should exercise above 90% MHR for 25 to 50 minutes per workout. As the body adapts to this stress, an even greater amount of stress can be placed on the body in order to maintain a 90% MHR reading.

It is known that a 90 minute match will be played 10 to 30 beats below a player's MHR. Therefore, we break up our heart rate feedback into five main zones: Anaerobic Maximum (100 – 96% MHR), Anaerobic Sub-Maximum (95 – 90% MHR), Aerobic Maximum (89 – 85% MHR), Aerobic Sub-Maximum (84 – 80% MHR), and Recovery (79 – 75% MHR). When educating our athletes on the importance of each zone, we try to touch on physiological principles. Refer to table 1 (above) for some of the principles we use within our heart rate program.

In order to compare athletes to their own individual effort history, those who play the same position, and the team as a whole, we have established a points system (a.k.a. exertion). A study by Shimojo (19) was used to help justify the grading scale. The slope of lactate accumulation was used to structure the progressive exertion evaluation. For each minute in the Anaerobic Maximum zone, 7.0 points are earned. As effort decreases, so does the point value of each zone (Anaerobic Sub-Maximum: 4.5/min, Aerobic Maximum: 3.3/min, Aerobic Sub-Maximum: 2.2/min, and Recovery: 1.7/min).

At the end of each week, exertion points are summed for each individual and a weekly team average is calculated. Players falling below one standard deviation (SD) are given extra conditioning. Those players above one SD are closely monitored for overtraining and commonly receive alternative conditioning. This may include bike sessions, pool workouts, film sessions, a session off, or even complete days off. Additionally this system rewards our players for giving their maximum effort at practice, which is our goal during the periods of time we are allowed to practice as a team.

After determining the exertion during a workout, that score is divided by the length of time that the data was analyzed. This number is considered "intensity" and allows us to make comparisons within any component of our conditioning package regardless of modality by giving us a value relative to points per minute. Each of our practices is analyzed from warm-up and team training to additional fitness when necessary. Following a team training session, each athlete is compared for the same duration (i.e., start of practice to the end of practice) to allow for a fair intensity comparison amongst the team per training session. Our fitness sessions have an intensity score of 4.9 – 3.2, and our walk through practices the day prior to competition are our lowest scoring session with a score of 2.0 – 1.1 as team averages. We provide tangible feedback to our athletes to help them learn the type of effort that is necessary at practice in order to be successful on game day. Our live competition scores range from 3.7 – 3.0 as a team average with this exertion points system. ■

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