Developing Aerobic and Anaerobic Fitness Using Small-Sided Soccer Games: Methodological Proposals

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ABSTRACT

SOCCER COACHES HAVE BEEN INCREASING THE USE OF SMALL-SIDED GAMES IN SOCCER TRAINING. THESE SMALL-SIDED GAMES SHOW A SIMILAR EFFICIENCY AS TRADITIONAL RUNNING METHODS (WITHOUT THE USE OF A BALL) IN DEVELOPING PHYSICAL FITNESS IN SOCCER PLAYERS. MOREOVER, SMALL-SIDED GAMES ENABLE THE DEVELOPMENT OF BOTH TECHNICAL SKILLS AND TACTICAL ACTIONS. HOWEVER, THERE IS LITTLE KNOWLEDGE ABOUT THE PROPER ORGANIZATION THAT IS NECESSARY FOR SMALL-SIDED GAMES TO ACHIEVE THE DESIRED EFFECTS IN SOCCER PLAYERS. THIS REVIEW AIMS TO SUMMARIZE THE PHYSIOLOGICAL EFFECTS ON SOCCER PLAYERS PROMOTED BY SMALL-SIDED GAMES AND TO DEVELOP A METHODOLOGICAL SCHEMATIZATION FOR ORGANIZING SMALL-SIDED GAMES.

INTRODUCTION

Soccer training has evolved over the past decades from methodological soccer training based on analytical training, in which fitness is the most important factor, to new approaches where the tactical performance is of greater importance. Both methods have been a subject of many scientific discussions. Nevertheless, it is difficult to discuss the best training methods when the primary theories supporting these methods are controversial. As a result, coaches must select methods by considering the players' skills, competence, and even culture. The aim of this article is to demonstrate how to organize small-sided games in soccer training without reducing the efficiency of fitness development of soccer players.

Analytical (*traditional*) training advocated fitness as the main factor affecting soccer performance. Even when practicing technical actions in training, the main priority is to develop fitness (10). In this method, the sessions are generally organized by fitness development and tactical/strategic preparation. Therefore, these sessions significantly increase the training time and reduce the specificity of the training over a long period. The primary benefit of this method is the development of players' general fitness by ensuring a strict control over the exercises during each task. A limitation of the analytical training method is the low level of specificity. Even when performing technical actions, the specific dynamics of the game are fragmented, thus reducing the tactical thinking, the interrelationships between players, and the potential to optimize the team's playing style (30). Nevertheless, in a soccer game, the players perform for 90 minutes with tactical awareness, identifying the specific dynamics of the game and self-organizing behavior during goal opportunities throughout the game. Thus, variability is always present in the game, as well as the tactical behavior and the specific relationships between players, teammates, opponents, and the ball (8). All physical and physiological responses are based on the behavior that each player demonstrates during the game. Thus, it is possible for a player with excellent long-distance endurance to lack tactical efficiency and for a player who lacks long-distance endurance to have a level of tactical behavior that is sufficient for high-quality performance (10). Based

KEY WORDS:
soccer; fitness training; small-sided games; performance

Table 1
Heart rate values for the number of players used per small-sided game

Number of players in game	Aroso et al. (2)	Owen et al. (24)[a]	Little and Williams (22)	Rampinini et al. (26)[a]	Williams and Owen (32)[a]	Hill-Haas et al. (15)	Owen et al. (25)	Dellal et al. (11)[a]	Köklü (20)[a]
1/side	—	178 HRmean	—	—	183 HRmean	—	—	—	—
2/side	168 HRmean	173 HRmean	89% HRmax	—	180 HRmean	89% HRmax	—	91.8% HRmax	88.8% HRmax
3/side	173 HRmean	176 HRmean	91% HRmax	90.9% HRmax	171 HRmean	85% HRmax	90% HRmax	90.2% HRmax	92.0% HRmax
4/side	158 HRmean	156 HRmean	90% HRmax	89.7% HRmax	165 HRmean	83% HRmax	—	86.4% HRmax	90.1% HRmax
5/side	—	164 HRmean	89% HRmax	88.8% HRmax	152 HRmean	—	—	—	—
6/side	—	—	88% HRmax	87.0% HRmax	—	—	—	—	—
7/side	—	—	—	—	—	—	—	—	—
8/side	—	—	88% HRmax	—	—	—	—	—	—
9/side	—	—	—	—	—	—	81% HRmax	—	—

[a]Highest values of each study. We collected the higher value in the different games reported in each study.

on these general arguments, small-sided games have recently been adopted to simultaneously improve players' physical fitness, tactical thinking, and the specific dynamics of the game (16).

Although fitness development based on running methods is well supported in theoretical literature, the methodology of using small-sided soccer games has not been sufficiently explored (14). Only 2 studies have developed general methodological considerations for fitness training based on small-sided soccer games (21,27). Therefore, greater methodological development for small-sided games in soccer training is needed to optimize the training periodization and help coaches systematize the sessions. This review aims to propose guidelines for soccer training based on small-sided games.

For this purpose, we will present a summary of the studies investigating the physiological responses of soccer players during small-sided games. We will present a table summarizing the intensities based on the heart rate response and blood lactate values of the athletes during each specific small-sided game. A section of targeted training will be developed based on these intensities. This specific section will discuss the general guidelines to develop small-sided game programs for the training of the lactate and oxygen systems.

SMALL-SIDED SOCCER GAMES: USING TASK CONSTRAINTS FOR PHYSIOLOGICAL STIMULATION

Physiological responses can be constrained by the type of task assigned by the coach. Usually, in small-sided games, there are 2 main ways to influence the physiological stimulus: (a) changing the number of players per game and (b) changing the dimensions of the field. Nevertheless, new approaches can be developed by modifying task rules, goals, or coaches' encouragements. All of these task constraints can be used by coaches to restrict the physiological stimulus, and it is important to understand the impact of these constraints on heart rate and blood lactate level.

Usually, the heart rate can be estimated using heart rate monitors. This equipment is now easily accessible to coaches, allowing players and coaches to achieve specific values and monitor the important heart rate variables. Such equipment is a noninvasive device and very user friendly. Moreover, with new technological advances, it is now possible to coordinate the heart rate information with a global positioning system, which provides variables such as distance covered, speed, and acceleration. There are many brands that commercialize such equipment, which can improve the coaches' intervention during each session.

CHANGING THE FORMATS OF GAMES

The majority of the literature indicates that small-sided games with a smaller number of players statistically increase heart rate response, blood lactate concentration, perceived exertion, and distance covered (1,9,16).

With some regularity, small-sided games with fewer players can promote values of approximately 90% HRmax (11,22). Nevertheless, the regular values vary between 80 and 90% HRmax (15,20,26). Table 1 presents a summary of the heart rate responses. We collected the values as presented by each author, thus the variables change between HRmean and HRmax.

Table 1 shows higher intensities tend to be achieved from games with 1-a-side to 3-a-side. In these games, it is possible to achieve values closer to 90% HRmax, which represent the ideal values for high-intensity endurance training and for the lactate system. Games with a larger number of players tend to provide intermediate to extensive aerobic training.

Other than heart rate, another physiological indicator is the blood lactate concentration. The majority of the reported results suggest that small-sided games with a smaller number of players statistically increase the blood lactate concentration (2,11,15,26). The literature shows that in small-sided games, the blood lactate values range between 2.6 and 8.1 mmol/L (16). The following table presents a summary of the studies analyzing the influence of the number of players on the blood lactate concentration (Table 2).

The relation between heart rate and blood lactate varies among people. Generally, the lactate threshold is approximately 50–60% HRmax in untrained people and 80% HRmax in trained people (18). The anaerobic threshold is a blood lactate concentration of approximately 4 mmol/L. In the results reported, the majority surpasses 4 mmol/L of blood lactate. Therefore, when the goal is to develop specific aerobic training, it is important to consider the blocks and repetitions per game to avoid these higher values.

CHANGING FIELD DIMENSIONS

Most studies report an increase in % HRmax, blood lactate concentration, and rate of perceived exertion in small-sided games played on fields with larger dimensions (5,24,32).

Statistically significant differences in heart rate response were found between small-sided games with the same number of players on different field dimensions (5,26). In both studies, higher heart rate values were achieved on fields with larger dimensions. However, in 1 case, no significant differences were found (19). Table 3 presents the different heart rate responses according to the dimensions of the field.

The results also suggest that greater field dimensions statistically increase blood lactate concentration values (2,26,31). It is possible to correlate the blood lactate response to the differences in the field dimensions (Table 4).

It is possible that bigger field dimensions increase the blood lactate concentration because of the increased space each player must cover and the decreased opportunity for recovery. According to the previously reported

Table 2
Blood lactate concentration in different numbers of players per game

Number of players in game	Aroso et al. (2)	Rampinini et al. (26)[a]	Hill-Haas et al. (15)	Dellal et al. (11)[a]	Köklü (20)[a]
1/side	—	—	—	—	—
2/side	8.1 mmol/L	—	6.7 mmol/L	4.6 mmol/L	8.1 mmol/L
3/side	4.9 mmol/L	6.5 mmol/L	4.7 mmol/L	4.1 mmol/L	7.2 mmol/L
4/side	2.6 mmol/L	6.0 mmol/L	4.1 mmol/L	3.2 mmol/L	6.9 mmol/L
5/side	—	5.2 mmol/L	—	—	—
6/side	—	5.0 mmol/L	—	—	—
7/side	—	—	—	—	—
8/side	—	—	—	—	—
9/side	—	—	—	—	—

[a]Highest values of each study—we reported the higher value reported by authors in their study.

Table 3
Influence of field dimensions on heart rate responses

Number of players in game	Field dimension	Owen et al. (25)[a]	Williams and Owen (32)[a]	Rampinini et al. (26)[b]	Kelly and Drust (19)[a]	Casamichana et al. (5)[b]
1/side	Smaller	176	—	—	—	—
	Medium	180	—	—	—	—
	Larger	183	—	—	—	—
2/side	Smaller	172	179	—	—	—
	Medium	169	—	—	—	—
	Larger	170	180	—	—	—
3/side	Smaller	167	164	89.5	—	—
	Medium	167	166	90.5	—	—
	Larger	174	171	90.9	—	—
4/side	Smaller	147	152	88.7	—	—
	Medium	162	—	89.4	—	—
	Larger	159	165	89.7	—	—
5/side	Smaller	156	—	87.8	175	93
	Medium	163	—	88.8	173	94.6
	Larger	165	—	88.8	169	94.6
6/side	Smaller	—	—	86.4	—	—
	Medium	—	—	87.0	—	—
	Larger	—	—	86.9	—	—

[a]HRmean.

[b]%HRmax.

results, the values range between 2.6 and 6.0 mmol/L. Therefore, smaller spaces can be more appropriate for aerobic exercises and activities with high intensity to reach the lactate threshold. However, larger spaces increase the blood lactate concentration and, as such, are recommended for anaerobic exercises and activities reaching $\dot{V}O_2max$ (maximal oxygen consumption).

CHANGING TASK CONSTRAINTS

Many different task constraints can be used by coaches to achieve the physiological, technical, and tactical goals for the training of soccer players. For instance, the coach can change the orientation and position of the goal and remove the goalkeeper. In addition, specific zones can be defined, the game rules can be changed, and the coach can avoid using verbal instructions or encouragement.

Using goalkeepers. The majority of studies on the influence of small-sided games with and without goalkeepers report a higher intensity in the games without goalkeepers (6,7,29). Some authors suggest that the teams tend to increase their defensive organization to better protect the goal during games with goalkeepers (23). Therefore, the team's offensive process is also more careful, which reduces the intensity of the play. A summary of the heart rate response in relation to the implementation of goalkeepers is presented in Table 5.

Only 1 study inspecting blood lactate concentration was identified. In this study (29), it was possible to observe that the highest blood lactate value was found in the 4-a-side game without goalkeepers (6.4 mmol/L), and the lowest value was in the 4-a-side game with goalkeepers (6.2 mmol/L).

Constraining the number of touches per player. At times, the coach imposes the rule that each player can only perform a given number of consecutive touches on the ball. This specific task constraint is used not only to increase

Table 4
Influence of field dimensions on blood lactate concentration

Number of players in the game	Field dimension	Aroso et al. (2)	Rampinini et al. (26)
3/side	Smaller	2.6 mmol/L	6.0 mmol/L
	Medium	—	6.3 mmol/L
	Larger	Increased	6.5 mmol/L
4/side	Smaller	—	5.3 mmol/L
	Medium	—	5.5 mmol/L
	Larger	—	6.0 mmol/L
5/side	Smaller	—	5.2 mmol/L
	Medium	—	5.0 mmol/L
	Larger	—	5.8 mmol/L
6/side	Smaller	—	4.5 mmol/L
	Medium	—	5.0 mmol/L
	Larger	—	4.8 mmol/L

the velocity of each offensive play but also to avoid players' individualism. A number of studies have analyzed this specific constraint (2,11).

One of the first studies that analyzed the restriction of touches per player was performed by Aroso et al. (2). In their study, a no-limitations, 3-a-side game was compared with a 3-a-side game with a maximum number of 3 consecutives touches per player. The results showed that in the 3-a-side game with restricted touches, the time spent walking increased, whereas the time spent standing still, sprinting, or performing lateral or backwards movements decreased as compared with the free-play 3-a-side game. However, only Dellal et al. (11) examined and provided values for heart rate and blood lactate concentration based on touch restrictions. These values are presented in Table 6.

Dellal et al. (11) demonstrated that heart rate increases as the number of touches decreases during small-sided games. In most situations, professional and amateur players reached lower heart rate values during the free-play game. Similar results were observed in the blood lactate value. It was possible to observe that a higher concentration of blood lactate was achieved in games with 1 consecutive touch per player.

Table 5
Influence of the use of goalkeepers on heart rate responses

Number of players in game	Goalkeeper	Sassi et al. (29)	Mallo and Navarro (23)	Casamichana et al. (7)
3/side	With	—	166 HRmean	—
	Without	—	173 HRmean	—
4/side	With	174 HRmean	—	161.4 HRmean
	Without	178 HRmean	—	162.9 HRmean

Using neutral players. Sometimes a neutral player is used to give offensive or defensive positions numerical superiority during a small-sided game. Usually, the neutral player only takes part in offensive or defensive moments with the attacking or defending team, respectively. Few studies have analyzed the influence of this task constraint on the heart rate and blood lactate responses (4,12). Nevertheless, it is important to examine this constraint. Table 7 presents a summary of the studies analyzing this issue.

In the 1-a-side and 4-a-side games, the highest heart rates were observed without a neutral player. In the 3-a-side game, the highest heart rates were achieved with a defensive neutral, and in the 2-a-side game, the highest heart rates were observed with an offensive neutral player. Consequently, it is not possible to confirm a pattern in the heart rate responses based on the use of neutral players.

However, the highest blood lactate concentrations were observed in the 1-a-side, 2-a-side, and 3-a-side games without neutral players. A higher heart rate response was observed in 2 games with a neutral defensive player rather than a neutral offensive player, whereas in the other 2 games, a higher blood lactate concentration was observed with a neutral offensive player rather than a neutral defensive player. Therefore, the use of neutral players does not clearly influence the heart rate responses or the blood lactate concentration (16).

SUMMARY OF THE GENERAL EFFECTS ON PHYSIOLOGICAL RESPONSES

Based on the previously presented analysis, we have developed a graphical representation of the relation of the heart rate and blood lactate intensities to the game shape used by coaches (Figure 1).

The small-sided soccer games can be influenced by many factors, thus the graphical representation (Figure 1) is by no means complete and exhaustive of all the possibilities. One of the

Table 6
Heart rate and blood lactate responses based on touch limitations

Number of players in game	Consecutive touches per player	Dellal et al. (11)			
		%HRmax		Blood lactate concentration (mmol/L)	
		Amateur	Professional	Amateur	Professional
2/side	1 touch	92.3	90.3	5.0	3.9
	2 touch	91.5	90.1	4.7	3.5
	Free	91.6	90.0	4.1	3.5
3/side	1 touch	91.2	90.0	4.6	3.6
	2 touch	90.0	89.4	4.1	3.4
	Free	89.5	89.6	3.7	3.1
4/side	1 touch	87.4	87.6	3.5	3.0
	2 touch	86.6	85.6	3.1	2.9
	Free	85.1	84.7	3.0	2.8

fundamental factors determining the physiological responses to the stimulus is the training regime. In fact, the playtime, the number of blocks and repetitions, and the recovery time between repetitions are considered to be the fundamental variables affecting fatigue and acute responses to the exercise.

Commonly, small-sided games are performed intermittently. Nevertheless, it is important to consider both continuous and intermittent regimes to improve the effects of the programs (1). The results are not consensual. However, when significant differences are reported, the highest values of %HRmax are achieved during the continuous regimes (16). This fact may be due to the recovery periods of intermittent regimes, which prevent the accumulation of fatigue (1).

Hill-Haas et al. (17) used 3 shapes of small-sided games (2-a-side, 4-a-side, and 6-a-side) played in intermittent (4 × 6 minutes with 1.5 minutes of recovery) and continuous (24 minutes)

Table 7
Heart rate and blood lactate responses with the use of neutral players

Number of players in game	+ Neutral player	Bekris et al. (4)		Evangelos et al. (12)	
		HRmean	Blood lactate	HRmean	Blood lactate
1/side	None	184	12.4	—	—
	Defender	178.7	10.2	—	—
	Attacker	177.3	8.3	—	—
2/side	None	180	9.4	—	—
	Defender	176.3	9.0	—	—
	Attacker	180.7	9.4	—	—
3/side	None	—	—	185.8	8.4
	Defender	—	—	188.8	8.4
	Attacker	—	—	183.8	9.1
4/side	None	—	—	177.0	4.1
	Defender	—	—	174.0	3.3
	Attacker	—	—	171.3	3.1

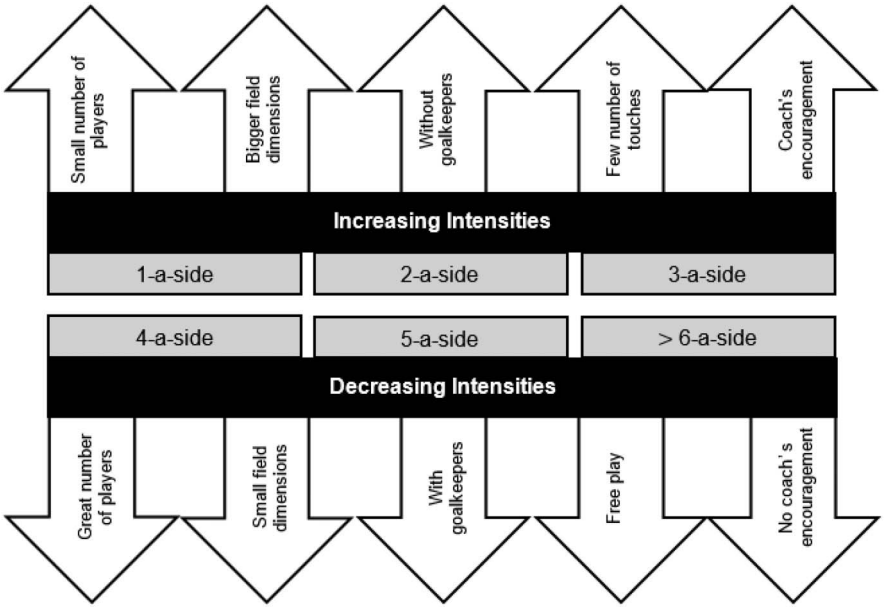

Figure 1. Graphical representation of the physiological responses to task constraints in small-sided games.

regimes. Significant differences between both training regimes were observed, and the highest %HRmax was achieved during the continuous regime. Nevertheless, the greatest distance at a high intensity (13.0–17.9 km/h) was covered during the intermittent regime. A similar study (13) used 3 different periods of time per repetition during intermittent training (2, 4, and 6 minutes) with a 3-a-side game and observed the heart rate response. The results showed a significantly lower heart rate response value in the 2-minute periods in comparison with the 4 and 6 minutes per repetition. A more recent study (20) compared the 2-a-side, 3-a-side, and 4-a-side games in intermittent and continuous training regimes. No significant differences between the heart rate responses were found in this study. However, significant differences in the blood lactate concentration were observed; a higher blood lactate value was achieved during the continuous training regimes in the 2-a-side game. In 3-a-side and 4-a-side concentration was higher during

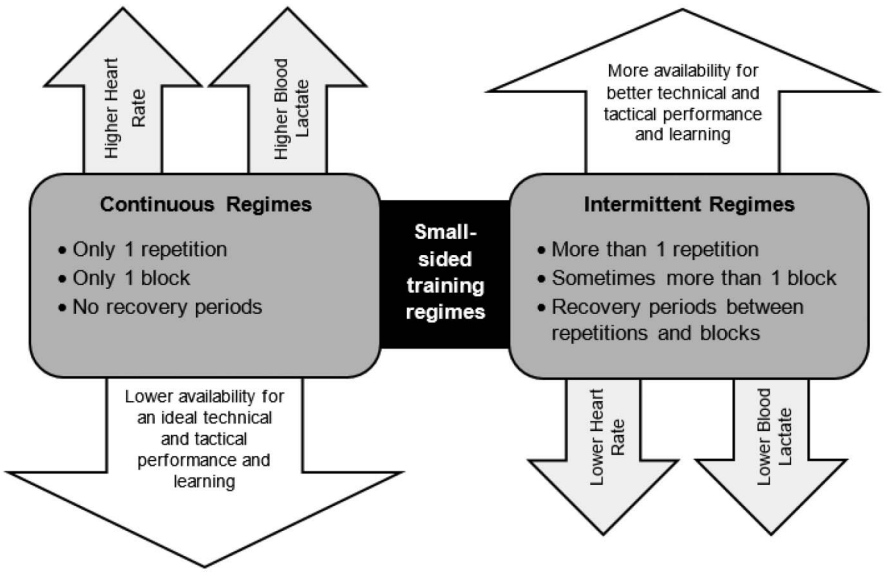

Figure 2. Schematization for small-sided training regimes.

Table 8 Principles of aerobic training		
	Mean (%)	**Range (%)**
High-intensity training		
%HRmax	90%	80–100
%$\dot{V}O_2$max	85	70–100
Low-intensity training		
%HRmax	80	65–90
%$\dot{V}O_2$max	70	55–85
Recovery training		
%HRmax	65	40–80
%$\dot{V}O_2$max	55	20–70

the continuous regimes but without statistical significance. Based on the analysis presented above, a graphical schematization for the small-sided training regimes was developed (Figure 2).

A reduction in motor coordination can be observed with high blood lactate accumulation (>6 mmol/L) because of soccer performance (18). The normal values reported in the literature for small-sided games range between 2.6 and 8.1 mmol/L (2,11,15,26). Therefore, it is very important to manage the acute physiological responses to the games regarding the heart rate and blood lactate target. When technical and tactical performance is of the highest priority, the accumulation of blood lactate concentration should be reduced to ensure an ideal motor response.

Based on the general recommendations for the organization of small-sided soccer games, the next section will discuss the management of training programs using small-sided games as the main variable for developing physical and physiological fitness.

TARGETED TRAINING USING SMALL-SIDED SOCCER GAMES

In soccer training, it is very important to specifically define the physiological targets. This theory is well developed in regular sports sciences handbooks. Nevertheless, it is essential to consider a set of new variables to ensure the highest quality of training development in the specific case of small-sided soccer games. Therefore, this section will present the generic recommendations for aerobic and anaerobic soccer training based on small-sided games.

AEROBIC TRAINING

Aerobic training is developed to improve the oxygen transport system (26). The oxygen system is best trained by endurance workouts, that is, exercises of relatively long duration at submaximal level (18). This specific training improves the ability to continue exercising for a prolonged period and the ability to quickly recover from high-intensity exercises (26). Usually, the intensity and volume of aerobic exercise are inversely related. Increasing the volume (time) of

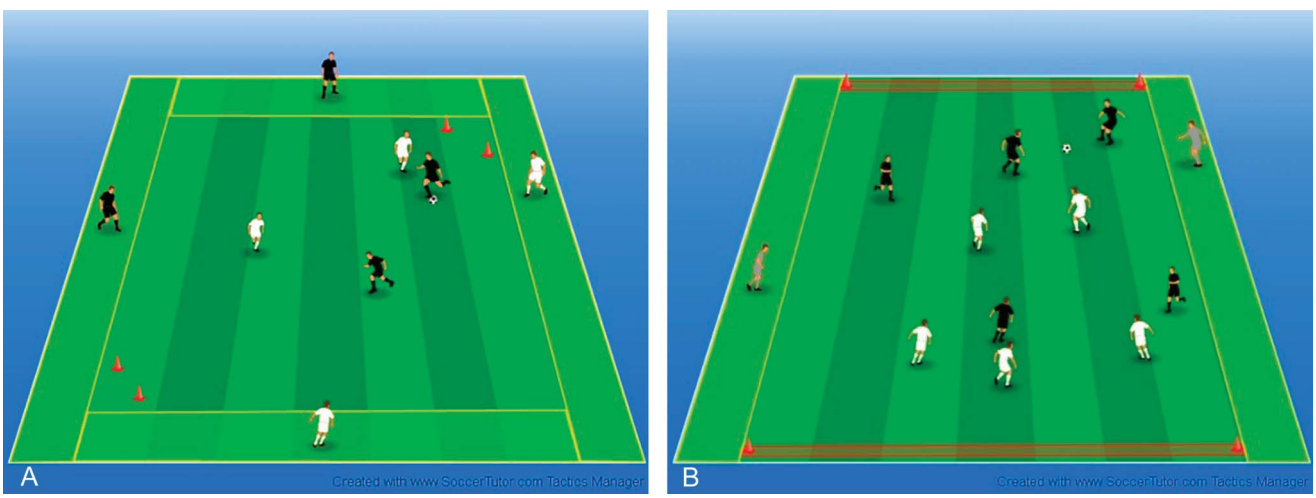

Figure 3. (A) 2-a-side with 1 supporter player. This specific task has a central zone played by 2 teams of 2 players. In the lateral area, there is one supporting player per team who only plays along this area. His objective is to support his teammates to overcome the opponents and score in one of 2 neutral goals. (B) 3-a-side game plus 2 neutral players. In this game, the aim is to cross the scoring lines behind the opponent's team. Players should cross the line with possession of the ball and in progression. The neutral players have a specific lateral area to support the team with ball possession.

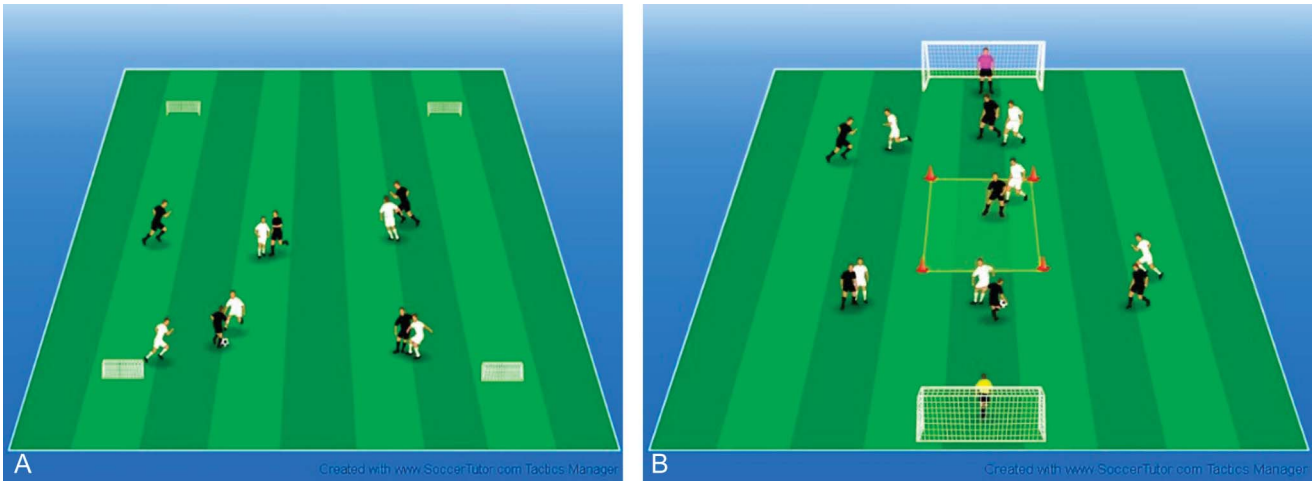

Figure 4. (A) 5-a-side game with 4 small goals. This exercise is performed on a medium field. Each team has 2 small goals to protect. The space beyond the goals is playable. (B) 6-a-side game with midfield penetration. This task has a specific tactical orientation. Before shooting, all offensive plays should involve a successful pass to a teammate in the specific midfield area.

aerobic training will reduce the intensity to a tolerable level.

Endurance training is developed to improve the aerobic capacity (26). There are 3 main types of endurance training methods: (a) intensive endurance training, (b) intermediate endurance training, and (c) extensive endurance training. Each endurance method is based on the training regime and the practice intensity. The principles of aerobic training are proposed by Bangsbo (3) in Table 8.

One can observe that the intensity values vary based on the different types of training targets. As presented above, intensity and volume of training are inversely related, and it is important to define specific regimes of training to ensure the specific intensities. Therefore, continuous and intermittent regimes must be properly used based on the specific training targets. The intermittent regime is based on practice with repetitions and blocks, which ensures high-intensity training followed by appropriate recovery periods. The continuous regime is used for the development of

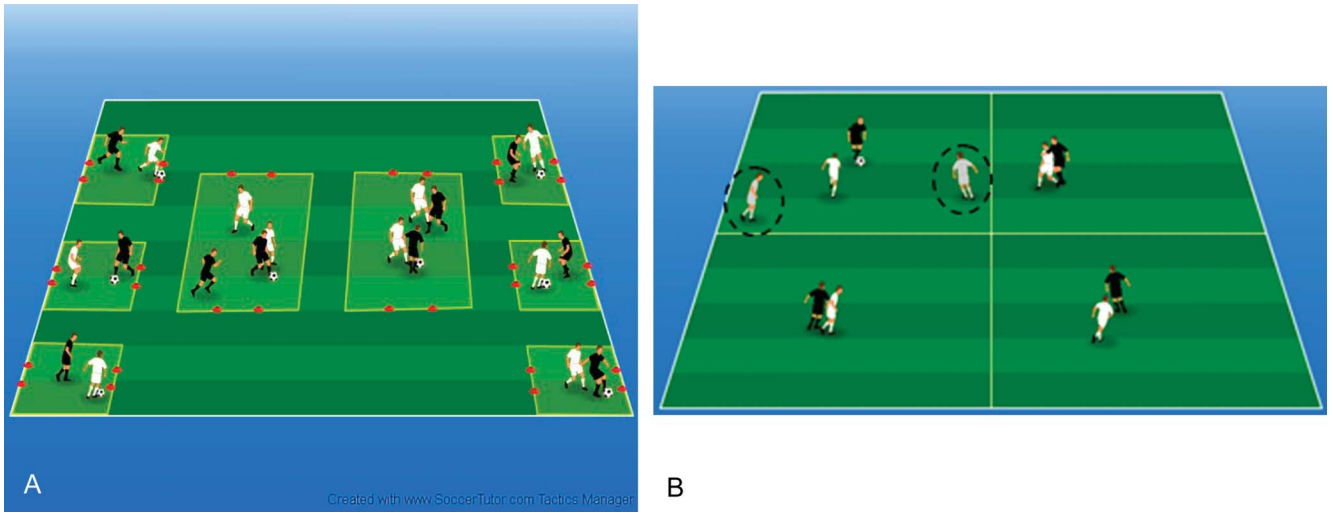

Figure 5. (A) 1-a-side and 2-a-side games stations. In this specific game, 1-a-side and 2-a-side soccer tasks are played at the same time. At each repetition, the players change the specific game. The aim of this task is to overcome the opponent and score by crossing the opponent's goal line. (B) 4-a-side game with 2 neutral players. Two teams of 4 players have 4 different sectors, thus each team has 1 player in each sector. The aim is to ensure equal ball possession. The neutral players are the only ones who can cross all sectors to provide a proximate supporter to the team with ball possession. The aim is to develop the anaerobic performance of the neutral players.

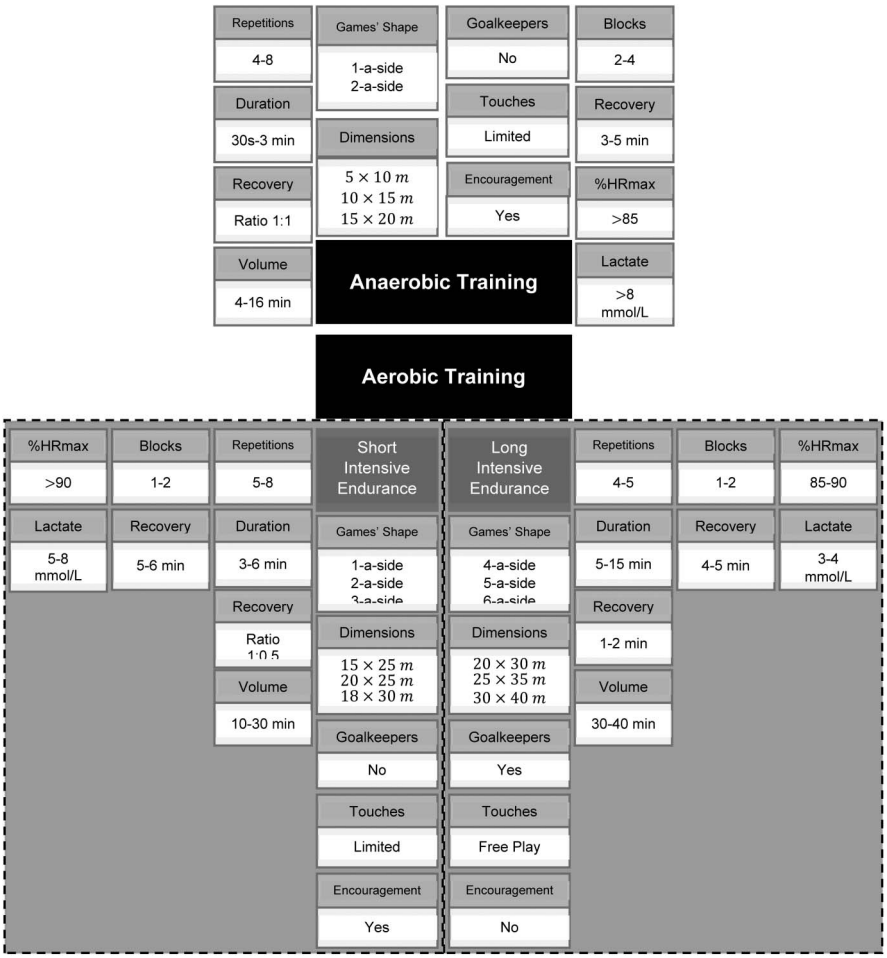

Figure 6. Methodological schematization for the organization of small-sided games.

aerobic fitness and ensures that the training will not increase the lactate levels above the threshold. Both regimes can be used for aerobic training and must be organized for intensive, intermediate, and endurance training. Generally, intermediate and extensive trainings are developed for specific long-distance sports with a regular cadence of practice and small oscillations such as cycling or marathon running. However, soccer has specific characteristics of both anaerobic and aerobic profiles because it is played at a minimum of 75% HRmax. Consequently, the following section will present only the purposes of short and long intensive endurance soccer training.

Short intensive endurance soccer training. Intensive endurance training has a duration between 2 and 8 minutes and can be best achieved by interval workouts at, as a rule, approximately 90% HRmax (18). In this type of specific training, an increase in the blood lactate value of up to 5–6 mmol/L is acceptable. In terms of intensity, this type of training can be considered the transition point between anaerobic and aerobic training. Commonly, the recovery time is between 4 and 6 minutes and the number of repetitions is between 5 and 8.

Small-sided games that ensure a specific heart rate response and blood lactate concentration include the 1-a-side, 2-a-side, and 3-a-side games using task constraints such as consecutive touch limitations, no goalkeepers, and practice on larger fields. Task examples for this specific aim are provided in Figure 3.

As a rule, the larger field is 15 × 25 m for a 1-a-side game, 20 × 25 m for a 2-a-side game, and 18 × 30 m for a 3-a-side game. The larger dimensions ensure a higher intensity level.

Long intensive endurance soccer training. Long intensive endurance training can be performed in 8- to 15-minute intervals (18). The intensity implies a blood lactate concentration of 3–4 mmol/L and heart rate values between 85 and 90% HRmax. The recovery period is approximately 5 minutes, and the number of repetitions varies from 4 to 5. This specific training should be performed without fatigue accumulation from other training sessions.

The ideal configuration for this specific training is a 4-a-side, 5-a-side, or 6-a-side game played on medium field

dimensions, including goalkeepers and without touch limitation. The focus is on achieving a higher quality of tactical play by increasing the mental activity needed to synchronize with the rest of the teammates to achieve the main goal. Figure 4 proposes 2-task examples.

The field dimensions can be 20 × 30 m, 25 × 35 m, or 30 × 40 m for the 4-a-side, 5-a-side, and 6-a-side soccer games, respectively.

ANAEROBIC TRAINING

High blood lactate concentrations (sometimes closer to 12 mmol/L) observed in professional soccer players during match play suggest that the lactate-producing energy system is highly stimulated in a soccer game (3). Therefore, the ability to repeatedly perform high-intensity tasks in soccer must be developed using anaerobic training (28).

Intensive anaerobic exercises lasting between 30 seconds and 3 minutes activate and exhaust the lactate system to its maximum; thus, the lactate system can be best trained by interval workouts (18). Usually, it is possible to perform 4–8 repetitions per block with recovery periods of 30 seconds to 3 minutes (ratio 1:1). The number of blocks can vary between 2 and 4 based on the number of repetitions per block (21), with recovery periods between blocks of 3–5 minutes.

Small-sided games that are appropriate for anaerobic training include 1-a-side and 2-a-side games, without goalkeepers, with touch limitations, smaller field dimensions, and coach's encouragement. It is possible to organize games with more players, but they should also include specific task constraints to develop the anaerobic training. Based on this, 2 small-sided games are presented as examples of anaerobic training (Figure 5).

This type of exercise is best performed on small or medium field dimensions. Dimensions of 5 × 10 m or 10 × 15 m are used for the 1-a-side games. For the 2-a-side games, dimensions of 10 × 15 m or 15 × 20 m should be used.

SUMMARY OF TRAINING TARGETS USING SMALL-SIDED SOCCER GAMES

The most important contribution of small-sided games to soccer training is the opportunity to develop physiological, technical, tactical, and social behaviors, simultaneously. Small-sided games have a great potential to improve the quality of training. However, the organization of small-sided games must be specifically developed based on the context, the players' level, and the multiple goals to be achieved. Therefore, it is important to provide a generic schematization for the organization of small-sided games (Figure 6).

This schematization allows for a great number of different small-sided soccer games to be developed based on the main tactical and technical goals defined for each session. In truth, small-sided games should always be organized with a specific tactical/technical target in mind. Small-sided games without a tactical goal would not be sufficient for the team and can be regarded as more of a fitness exercise. Developing specific task constraints to attune players to the principles of play and specific tactical behavior can optimize and improve the quality of training. In fact, training tactical and technical behavior simultaneously aids in the development of physical fitness and is a great opportunity to reduce the volume of training, ensuring the same quality of training with a longer period to recover between sessions.

CONCLUSION

Training sessions based on small-sided games are very important in soccer. This type of game makes it possible to address many variables at the same time. Therefore, it is important to define some methodological guidelines to optimize training. In this article, we identified that small-sided games with a small number of players, bigger field dimensions, without goalkeepers, with touch limitations, and with coach encouragement increase the heart rate and blood lactate response. Small-sided games with a higher number of players, smaller field dimensions, with goalkeepers, without touch limitations, and without the coach encouragement decrease the physiological intensity. Based on these findings, it was possible to develop methodological guidelines for using small-sided games in aerobic and anaerobic soccer training. It is important to emphasize that small-sided games must be used properly by coaches to provide additional value to the training session. As a result, it is not enough to use small-sided games without task constraints. It is important that each coach develops specific small-sided games for the particular needs of his team. Therefore, tactical behavior and principles of play are the most important factors for the organization of small-sided games, even when the main goal is to develop the players' fitness.

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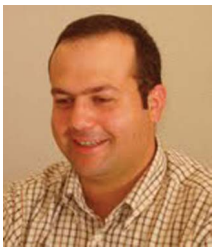

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