

# Periodization Based on Small-Sided Soccer Games: Theoretical Considerations

Filipe M. Clemente, MSc,<sup>1,2</sup> Fernando M. L. Martins, PhD,<sup>1,3</sup> and Rui S. Mendes, PhD<sup>1</sup>

<sup>1</sup>Polytechnic Institute of Coimbra, ESEC, Department of Education, Coimbra, Portugal; <sup>2</sup>Faculty of Sport Sciences and Physical Education, University of Coimbra, Coimbra, Portugal; and <sup>3</sup>Instituto de Telecomunicações (IT), Delegação da Covilhã, Coimbra, Portugal

## ABSTRACT

SMALL-SIDED GAMES ARE USUALLY USED IN SOCCER TRAINING TO DEVELOP ELEMENTS OF PHYSIOLOGICAL, PHYSICAL, TECHNICAL, AND TACTICAL PERFORMANCE. NEVERTHELESS, FEW STUDIES HAVE ATTEMPTED TO ANALYZE THE PHYSIOLOGICAL EFFECTS OR PROVIDE METHODOLOGICAL CONSIDERATIONS FOR TRAINING PERIODIZATION USING SUCH GAMES. THUS, THE AIM OF THIS PAPER IS TO REVIEW THE GENERAL EFFECTS OF SMALL-SIDED GAMES IN TERMS OF PHYSIOLOGICAL RESPONSES. AS A RESULT, A SMALL REVIEW WAS DEVELOPED TO CONSIDER SOME METHODOLOGICAL CONSIDERATIONS TO IMPLEMENT IN SOCCER TRAINING. FINALLY, AN EXAMPLE WAS PROPOSED OF A WEEK SPENT CARRYING OUT SOCCER MICROCYCLES AND ORIENTATIONS IN ORDER TO ADOPT SMALL-SIDED GAMES FOR EACH SESSION.

## INTRODUCTION

Small-sided games are modified games adjusted by coaches in a sports training context (11). These adjustments are performed to

simplify and preserve the specific characteristics of invasion team sports (47). Small-sided games are originated from nonformal street football, where players spontaneously adapt to the game's shape, reducing the field dimensions and the number of players or even changing some rules (21). Nowadays, there is a global recognition for the multiple benefits of small-sided games (1,44) because they have become very popular in teaching and training sports, at all ages, levels of experience, or skill levels (40). The main benefit of small-sided games is the possibilities they offer for developing in terms of physical, physiological, technical, and tactical performance qualities (17,35). Small-sided games can provide valuable preparation for the specific demands of formal team sports games (18), improving the variability of learning and ensuring an optimal unpredictability level for developing decision making and creativity (3,47). Moreover, small-sided games are closely related to the high motivational and engagement levels of players (43,46). Thus, because of their increasing tendency to be used by coaches, mainly in soccer, there has been more sports science research into small-sided games in the last decade (21,35,39).

The main findings can be observed in Figure 1.

Literature suggests that while using small-sided games, it is possible to achieve similar or even higher values of heart rate (HR) responses in comparison with regular 11-a-side (2,7,18,20). Similar results were found for the blood lactate concentrations and distance covered as well (7). In that sense, small-sided games are very similar to the 11-a-side game from a physiological and even technical/tactical viewpoint (1,11,21).

Therefore, small-sided games must be properly analyzed to identify their specific influence on soccer players' performance. Thus, many studies have been performed to try to characterize the specific influences of change of some properties, such as the number of players, field dimensions, or task constraints/rules (21). Keeping this in mind, the following section will present a summary of the main results about change for small-sided games' properties in terms of physiological and kinematic responses.

## KEY WORDS:

sports training; periodization; small-sided games; soccer

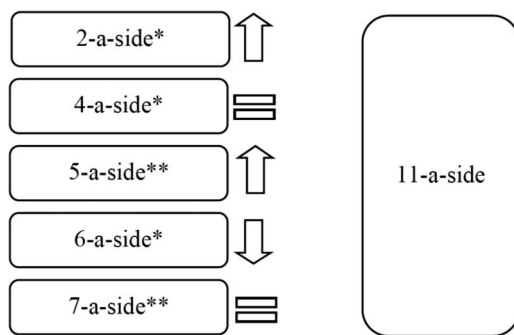


Figure 1. Comparison of heart rate responses between small-sided games and 11-a-side game. Figure created based on results from Hill-Haas et al. (20)\* and Allen et al. (2)\*\*.

### IMPLICATIONS OF SMALL-SIDED SOCCER GAMES ON PHYSIOLOGICAL AND KINEMATICAL RESPONSES

Different shapes of small-sided games can produce different responses in soccer players' performance. Therefore, some studies have analyzed the specific influence of each alteration on small-sided formats. Generally, this involves 3 main kinds of alterations: (a) number of players, (b) field dimensions, and (c) task constraints to be observed. Thus, in this section, some general conclusions about each kind of alteration will be discussed.

#### NUMBER OF PLAYERS

It is possible to regulate the intensity of exercise and the technical and tactical actions performed just by adjusting the number of players per small-sided game (21,26). This has been clearly established in the last few years, mainly with reference to soccer training (30,35,39). With some regularity, small-sided games with fewer players can promote values of around 90% HRmax (30,36). Nevertheless, the regular values vary between 80 and 90% HRmax (21). Figure 2 reports HR values achieved in small sided games with different numbers of players (1,30,35,39).

There is a consensus about the physiological impact of small-sided games in soccer players. In fact, the majority of literature suggests that small-sided games with a smaller number of players statistically increase HR responses, blood lactate concentration, rate of

perceived exertion (RPE) (6), and distance covered (1,4,11,21,22,39). In the case of small-sided games, the values reported by the literature range between 2.6 and 8.1 mmol/L (4,14,22,39).

#### FIELD DIMENSIONS

The distance to cover in the field is highly important in determining the trajectories and distances performed by soccer players (11,50). Usually, the area per player is determined by the total area of the field divided by the number of players (21). From the perspective that the space to cover induces some changes on physiological responses, some studies have been developed to determine the soccer players' responses (8,35,38). Usually, such studies use 3 different dimensions: small, medium, and large. These studies report the general variation of HR intensities with different field dimensions (Figure 3; 1,8,27,39).

The results are not consensual with regard to physiological responses to

the statistical significance of changing field dimensions (1,11). Nevertheless, the majority of studies report an increasing tendency of %HRmax (8,39), blood lactate concentration (4,27,48), and RPE (4,8,38,39) in small-sided games played within larger dimensions.

#### TASK CONSTRAINTS: USING DIFFERENT CONSTRAINTS TO MANAGE THE INTENSITY

During training sessions, the coach adjusts the rules and goals of games to make possible the development of a specific technical/tactical content (19). Usually, these adjustments are designated as task constraints (33). Task constraints are very useful for coaches to attune the players' perception to the specific goals of the task (47), thus helping them in the learning process and improving their performance (12).

Many task constraints can be adopted, such as the presence or absence of goalkeepers, the goals' dimensions, specific zones per player, neutral players, and limitation of contact per player or different kinds of encouragement from coaches. An illustrative summary of the effects on physiological intensity (4,9,10,15,31,39,45) can be observed in Figure 4.

The majority of studies carried out on soccer that compared small-sided games with and without goalkeepers suggest a higher intensity in games without goalkeepers. Some authors suggest that during games with goalkeepers, the teams tend to increase their defensive organization to better protect

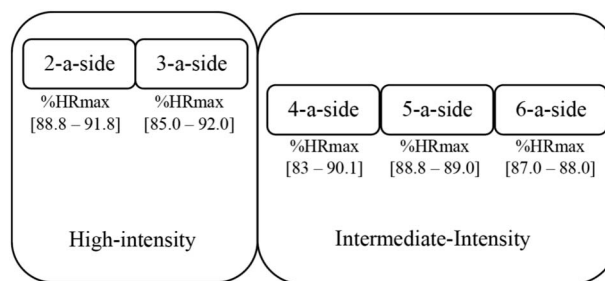


Figure 2. Summary of higher values found in different studies performed in small-sided games that compared different number of players (1,30,35,39).

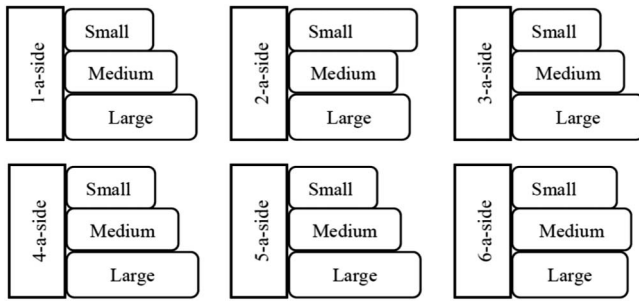


Figure 3. General variation of HR intensities with different field dimensions (1,2,3,4,5,6-a-side).

the goal (31). Therefore, the team’s offensive process is also more careful, thus reducing the intensity of the play.

It was also found that the limitation of touches increased the HR responses (4,15) and blood lactate concentration in amateurs and professional soccer players (15). The velocity and frequency of actions in small-sided games with limitation of touches may justify the higher intensity.

In the case of coaches’ encouragement, it is possible that such extrinsic motivation may increase the HR responses of players (39). Such results can be justified by the higher commitment of the players during the task.

**GENERAL RECOMMENDATIONS TO DEVELOP SMALL-SIDED SOCCER GAMES WITHIN THE TRAINING CONTEXT**

This section features the studies that analyzed different regimens of small-

sided games. Using this information, some general recommendations to develop small-sided games in a soccer training context will be presented.

**SMALL-SIDED GAMES TRAINING REGIMENS**

In the beginning, there was some distrust about the results of measuring the effects of small-sided game programs in comparison with the classical methods based on running and developing players’ fitness (21). Therefore, some studies compared the real effects of classical interval running training with small-sided game programs (14,42,45). All studies reported similar effects of small-sided programs and running interval training programs. No study showed statistical differences between the programs in all the studies analyzed (14,20,45).

Other studies have included making a comparison between continuous

and intermittent small-sided training regimens (16,23,28). Usually, small-sided games are performed in an intermittent way. Nevertheless, it is important to consider both regimens to improve the effects of the programs (1). The results are not consensual. Nevertheless, when statistical differences are reported, the highest values of %HRmax are achieved during the continuous regimens (16,23). This fact may be because of the recovery periods of intermittent regimens that avoid the accumulation of fatigue (1).

**GENERAL RECOMMENDATIONS**

Considering previous studies about the effects of different small-sided games in physiological responses, as well as the different effects of training regimens, it may be possible to develop general recommendations to apply to soccer training sessions.

The first important factor to determine the shape of small-sided games is to classify the field dimensions to standardize the dimensions’ categorization. Therefore, Table 1 shows the field dimensions recommended for different shapes of small-sided games based on Little (29).

Using the different kinds of field dimensions and number of players per small-sided game can determine the nature of some training programs based on the intensities that are achieved during practice. As previously explained, the small-sided games with fewer number of players increase the intensity of practice, achieving values greater than 90% HRmax in 2-a-side, 3-a-side, and 4-a-side games (39). These activities can be used to develop anaerobic or  $\dot{V}O_2$ max programs. For the small-sided games with more players such as 5-a-side, 6-a-side, or 7-a-side, the values range between 80 and 90% HRmax (22). Therefore, these values are adjusted more to lactate threshold training programs (25). Using these referential values, Table 2 shows some methodological suggestions to develop small-sided games (29).

One of the main capabilities in soccer is to quickly recover from anaerobic

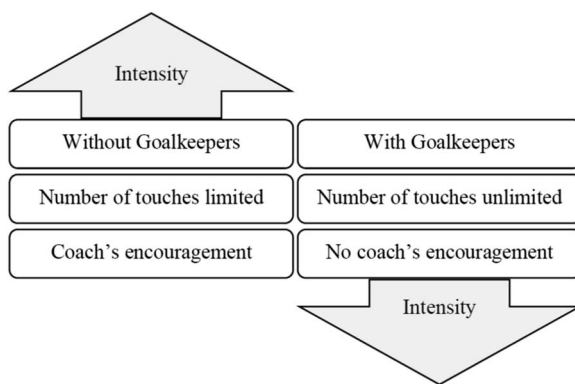


Figure 4. Summary of intensity responses based on different task constraints (4,9,10,15,31,39,45).

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**Table 1**  
Field dimensions (width × length) for different small-sided shapes

	1-a-side	2-a-side	3-a-side	4-a-side	5-a-side	6-a-side
Small (m)	5 × 10	10 × 15	12 × 20	16 × 24	20 × 28	24 × 32
Medium (m)	10 × 15	15 × 20	15 × 25	20 × 30	25 × 35	30 × 40
Large (m)	15 × 20	20 × 25	18 × 30	24 × 36	30 × 42	36 × 48

efforts ensuring high performance levels during a match. Thus, this capability can be developed in small-sided games with fewer players (2-a-side) with a duration of 1 minute and a similar time to recover (40), ensuring a practice-recovery ratio of 1:1. In a training organization, 2 main groups can be defined, so that 1 group practices the exercise and the other recovers from the task. With this method of organizing practice, blood lactate concentration increases as the training progresses (41), so the session can be planned by sets of 4 repetitions with 5 minutes of recovery between sets (40). Similar to this previous proposal, it may be possible to redefine other training regimens to develop other physical capabilities such as aerobic endurance.

In all training situations, the periodization should be programmed based on the coaches' perspectives and the players' requirements. From the macro to the micro periodization, soccer has evolved to define an optimal

performance over the whole season rather than in specific moments. In fact, a regular season for a soccer team lasts for around 10 months and in many cases involves 2 games per week. Thus, the team should keep a regular performance and not irregular such as other sports where the competition is not periodic. Therefore, the macrocycles have been replaced by microcycles that ensure a continuous level during all season (34). In this sense, the following section will propose an example of microcycles for soccer training.

#### SUGGESTING A MICROCYCLE PERIODIZATION FOR SOCCER TRAINING

A set of microcycles are presented for different periods of the season such as preseason and during the season with 1 or 2 matches per week. Examples will be proposed for professional soccer players.

#### PRESEASON

During preseason, increasing the volume of work and maintaining low levels of intensity take the highest

priority, aerobic workouts are performed regularly (5). With the proximity of first official matches, aerobic training with low intensity is gradually replaced by high-intensity workouts. Moreover, the anaerobic workout can also be important to improve the recovery capability from high-intensity workouts that produce higher blood lactate concentrations (Table 3).

The highest recommendation in the pre-season is low-intensity aerobic workouts. Therefore, formats such as 6-a-side, 7-a-side, or 8-a-side are most appropriate. Such games must be performed in small/medium dimensions with 4–5 repetitions of 5–15 minutes. The recovery periods between drills must be 1–2 minutes and the overall volume between 30 and 40 minutes.

The high-intensity aerobic training formats between 3-a-side and 4-a-side played in large field dimensions (20 × 25 m and 25 × 30 m, respectively) should be performed with 5–8 repetitions of 3–6 minutes using 1–2 blocks of practice. The overall workload may be between 10 and 30 minutes.

#### WEEKLY TRAINING

After a preseason suggested by McMillan et al. (32), aerobic endurance performance of professional soccer players did not change significantly during the in-season period. The same evidence was described by Thomas and

**Table 2**  
Methodological suggestions to developing small-sided soccer games

	Shape of game	Lactate threshold	Vo <sub>2</sub> max	Anaerobic
		5-a-side to 8-a-side	3-a-side to 4 a-side	1-a-side to 3-a-side
Intensity	%HRmax	80–90	90–95	>85
	RPE	Quite hard	Stressful	Maximal
	Blood lactate (mmol/L)	3–6	6–12	>10
Duration	Total work (min)	30–60	12–35	4–16
	Repetitions	1–8	4–8	2–4 sets of 4–8
	Repetitions duration (min)	30–60	3–6	20 s to 3 min
	Recovery	<1 min	Ratio: 0.5:1	Ratio: 1:4

RPE = rating of perceived exertion.



**Table 3**  
Priority of fitness development during a soccer season of 10 months

	Months	Preseason		Season							
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Aerobic	Low intensity	↑	↑	⇒	↑	⇒	↑	⇒	↑	⇒	↑
	High intensity	⇒	↑	↑	↑	↑	↑	↑	↑	↑	⇒
Anaerobic	Speed endurance	↓	⇒	↑	⇒	↑	⇒	↑	⇒	↑	⇒
	Speed	↓	↓	↑	↑	↑	↑	↑	↑	↑	↑

↑ = high priority; ⇒ = moderate priority; ↓ = low priority.

Reilly (49). Therefore, the use of high-intensity levels of aerobic stimulation during 3 sessions is enough to ensure this capability. Nevertheless, such workload can be different from country to country and even during the season considering the number of matches per week. In the case of Italian soccer, it can be possible to see 2 periodization examples (24) for 1 and 2 matches (Figure 5).

In this Italian case, it is possible to observe that the highest volume is performed in the intermediate days between matches. In the case of a week with only 1 match, it can be performed on 2 consecutive days with great volumes. In the case with 2 matches, only 1 day can be destined to great volume of workload. Nevertheless, in English soccer (37), it is possible to observe from some publications a changing in the weekly workload (Figure 6).

The main difference between Italian and English periodization (for 1 match per week) from the examples provided by

literature is that the English team (case study) provided a full rest day in the middle of the week. Taking into account the Italian example of periodization, there is no rest day in the middle of the week but rather 2 days of tapering are used with low stimulation before the match.

Despite these representations, it is important to understand how small-sided games can be organized in such periodization. Thus, some small-sided game orientations were defined based on the training workload of Bangsbo (5) (Figure 7).

Obviously, the workload orientations must be organized based on the specific performance level of players. Moreover, the different types of style of play may influence the level of players' stimulation and needs. Nevertheless, in this work will be presented an example of a microcycle with some drills and orientations for 1 professional team that has 1 match per week and have the ideal levels of aerobic and anaerobic capabilities.

In this specific weekly workload, specific small-sided games were developed to ensure an ideal achievement of intensities and tactical principles (Figure 8). In the case of 2 days before the match, the speed endurance maintenance was given priority. Therefore, a 1v1 with 1 neutral player to give more opportunities to explore the counterattack was developed, thus increasing the speed of actions to overcome the player who loses the possession of the ball. In the cases of 5 days and 1 day before the match, the main aim is to recover. Therefore, a constrained game was used. This game clustered the players of both teams in 2 different spaces to avoid a lot of running and to increase the ball circulation.

For the case of 4 days before the match a smaller shape of game was proposed. Such games increase the intensity of exercise and the number of turns, contacts with opponent and accelerations, thus being adequate to develop the specific strength and high-intensity aerobic training. Finally, the games in the middle of the week (3 days before the match) aim to increase the workload and to reduce the intensity. Therefore, bigger shapes of game are recommended. In this case, a game with 2 goals to develop the defensive cover and organization was proposed.

Let us provide an example of a microcycle based on weeks with only 1 game each Sunday. Following the previously expressed ideas about maintaining the same kind of volumes and intensities (13), it is possible to show a standard weekly pattern based on specific forms of stimulation (Figure 8).

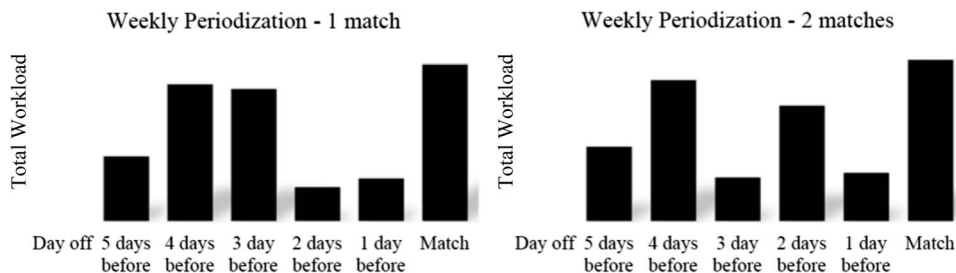


Figure 5. Weekly periodization in an Italian soccer team (24).

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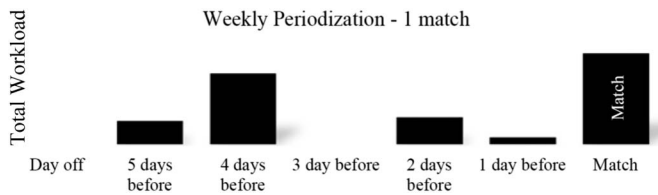


Figure 6. Weekly periodization in an English soccer team (13).

In this microcycle, on Wednesday, training requires high muscular contraction velocity, short contraction duration,

and high tension as pattern of muscular contraction. Therefore, the small-sided games in this specific day must require

a high level of intermittence and density of eccentric contraction including a high number of brakes, accelerations, trajectories turning, or jumps (34). Thus, small-sided games with small dimensions and a few number of players to increase the individual participation are the most effective.

For the Thursday training sessions, the specific physical preparation is based on more continuous effort, increasing the muscular contraction duration and

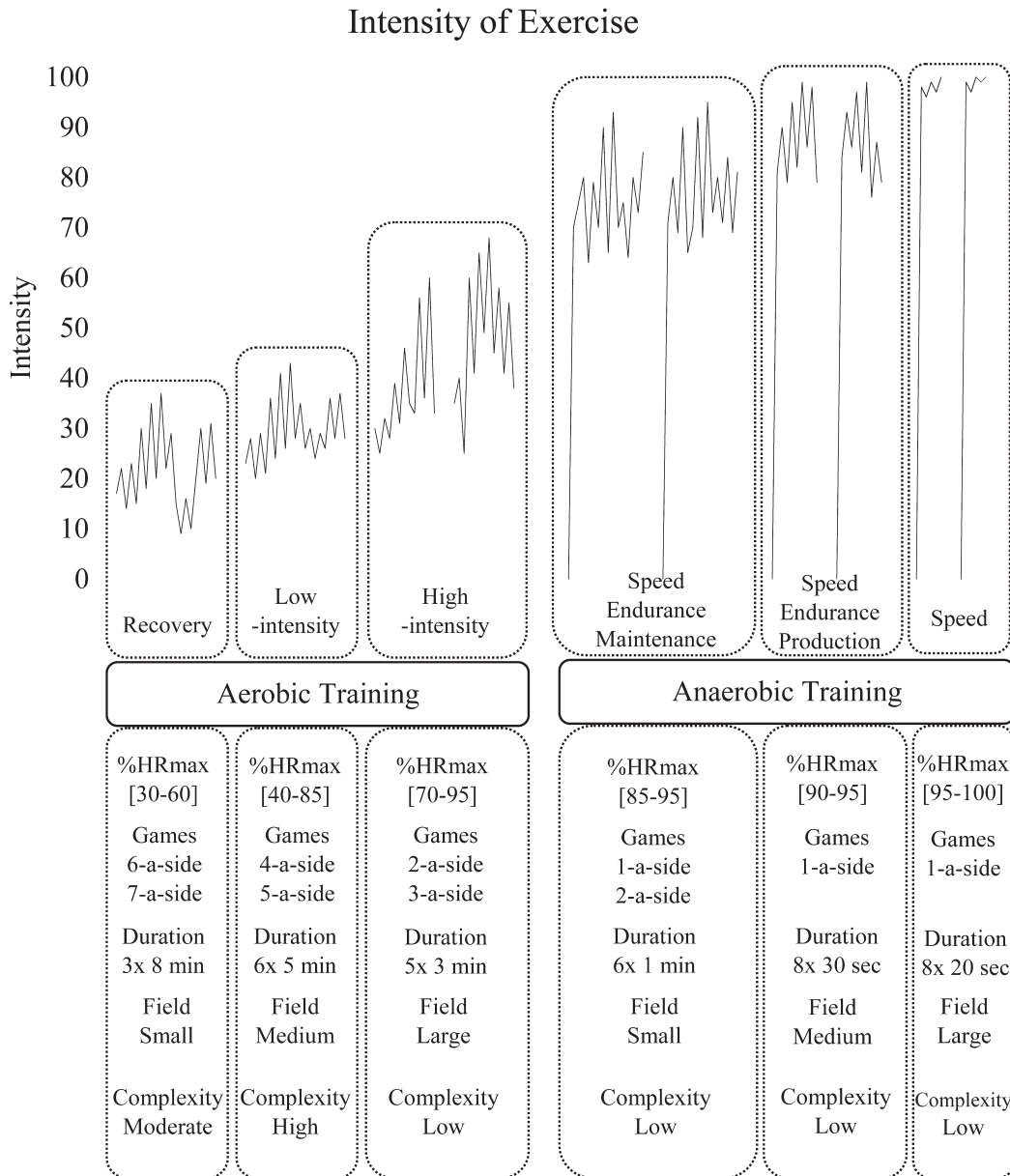


Figure 7. Proposals of intensities and recommended games for different training targets.

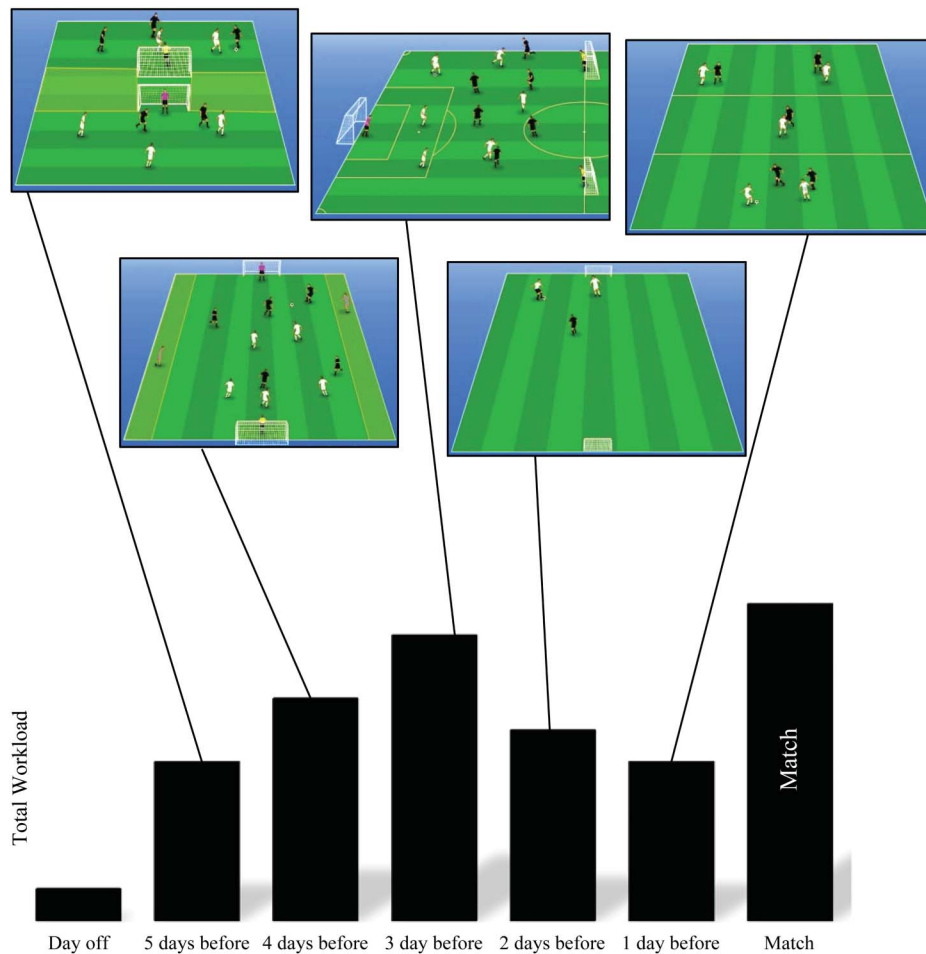


Figure 8. Workload during the weekly periodization and kind of games.

reducing contraction velocity and tension as well (34). Therefore, the small-sided games must be practiced on large dimensions, with more time of practice and number of players. This kind of training will increase the blood lactate concentration and the general effort of players. Thus, it is developed in this specific week day to give more time to recover for the next game. Nevertheless, the time of practice should contain repetitions to ensure that the fatigue does not interfere with the performance quality in the small-sided games.

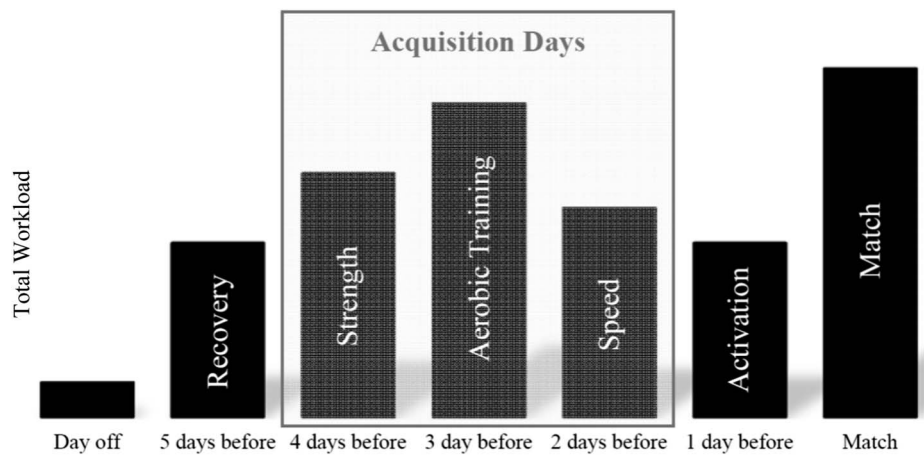
On Friday (the last acquisition day of the week's program), the training should require a high muscular

contraction velocity, short contraction duration, and no maximal tension (34). Therefore, the specific small-sided games must be small or medium with regard to field dimensions, with a smaller number of players and small number of repetitions per set. Furthermore, the task should not include physical contact and activities such as jumps, turns of movement, or breaks.

To systematize all the recommendations, a summary is shown in Table 4, which gives some instructions to apply to each small-sided game, considering the specifications of Figure 9.

It is important to consider that small-sided games are not only a small version of a formal game. Many small-sided

games change the rules and have specific task constraints to improve the tactical performance of players by preparing them for the next match. Therefore, the suggestions provided in Table 4 are not only for the simple small-sided games but also for all small-sided games. Actually, the physical dimension in this kind of periodization is just a small part of the whole plan. Therefore, in a regular training session of 90 minutes, the specific exercises required to develop fitness should be replaced by specific small-sided games with well-defined tactical content, meanwhile developing specific physical capabilities. By following this methodology, it may be possible to optimize the specificity of training and increase the contact of



**Figure 9.** A microcycle proposal for a week of soccer training.

players with the fundamental tactical concepts that are essential to improve the synchronization between teammates and increase the possibilities of acting as a team.

**CONCLUSIONS**

This article has proposed a set of suggestions and methodological recommendations to implement small-sided

games during a soccer season. It was observed that changing the number of players, field dimensions, and task constraints can possibly induce different physiological responses. Thus, it was possible to determine that it may be possible to increase the HR responses, blood lactate concentration, and RPE by increasing the field dimensions, reducing the

number of players, or playing without goalkeepers using small goals. It was also determined that for a periodization based on small-sided games, 1 good periodization alternative is to stabilize a standard microcycle, just by changing the kind of small-sided games being played. Therefore, this article showed some methodological alternatives to implementing

**Table 4**  
Recommendations for each small-sided game organization during a microcycle

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Number of players	Game	Day off	4-a-side; 5-a-side; 6-a-side	2-a-side; 3-a-side; 4-a-side	5-a-side; 6-a-side; 7-a-side	2-a-side; 3-a-side; 4-a-side	4-a-side; 5-a-side; 6-a-side	Game
Field dimensions			Medium	Small	Large	Medium	Medium	
%HRmax			60–75%	80–90%	>90%	>85%	60–75%	
RPE			Moderate	Maximal	Stressful	Maximal	Moderate	
Blood lactate			3–6 mmol/L	7–10 mmol/L	6–12 mmol/L	6–8 mmol/L	3–6 mmol/L	
Repetitions			1–8	3–6	4–8	3–5	1–8	
Duration of repetitions			6–15 min	30 s to 3 min	3–6 min	20 s to 2 min	6–15 min	
Sets			1–2	2–4	2–3	3–5	1–2	
Ratio: work/recovery			1:0.2	1:1	1:0.5	1:1	1:0.2	
				1:2	1:1	1:2		

RPE = rate of perceived exertion.



small-sided games in soccer training periodization.

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**Filipe M. Clemente** is a PhD student in Sports Sciences with a specialization in Sports Training at the Faculty of Sport Sciences and Physical Education of the University of Coimbra.



**Fernando M. L. Martins** works at the Polytechnic Institute of Coimbra, Coimbra College of Education (ESEC) and he is a Professor in the

Department of Education (Mathematics and Mathematics Education) and researcher on Instituto de Telecomunicações developing projects about mathematics applied to Sports Sciences.



**Rui S. Mendes** works at the Polytechnic Institute of Coimbra, Coimbra College of Education in the Sports and Physical

Education Department.

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