Small-sided games in young soccer players: physical and technical variables

Abstract

Aim: The Small-sided games are very widespread football training exercises to improve both the physical condition and the technical abilities. The aim of the study is to evaluate and compare the internal load of the young football player using the heart rate (HR) and the perceived exertion (RPE) and to describe the type and amount of some technical skills in 3v3, 4v4 and 5v5.

Methods: Young soccer players.

Results: The study shows that the size with small number of players allows to have a greater internal load both in reference to the HR (3v3: 87,2±3,3%; 4v4: 83,8±3,8% p<0.05; 5v5: 83,7±3,6% p<0.05) both for the RPE (3v3: 17,5±0,7 AU; 4v4: 16,4±1,3 AU p<0.05; 5v5: 15,8±1,1 AU p<0.001), while the format with large number of participants makes it possible to achieve a higher number of technical skills (76% successful passes; 24% bad passes; n°59 tackles)

Conclusion: The results showed that the 3v3 is more effective for a high-intensity aerobic training, because it generates a cardiac response that comes close to 90% of the HR max while the format with a larger number of players produced an increase in the number of specific technical skills.

Keywords: small-sided games, heart rate, young soccer players, football technical exercises, rpe

Introduction

The Small-Sided Games (SSG) is technical exercises submitted in the form of games appropriately modified by the coaches and/or fitness coaches on the basis of sport specific training. These variations are done to simplify and preserve the specific characteristics of team sports practiced. The SSG produce numerous benefits in the soccer players; these functional benefits are described in detail in the literature. SSG are very widespread football training exercises to improve both the physical condition and the technical abilities, both in adults than in young soccer players optimizing the training time.

The literature suggests that compared to traditional matches 11vs11, the SSG allow to get similar or even higher values in relation of heart rate, to the concentration of blood lactate, as well as to the distance covered; resulting, thus, very functional for the physical and technical training. In the youth training, it is sought training proposals that are appropriate in the physiological characteristics of young soccer player and that may increase the functional values and technical skills.

Even the cognitive aspects relating to understanding of the game for young soccer players, also seem to depend on the field sizes, the number of players and the type of the exercises. In addition to motivational aspects and learning, the SSG, already from the prepupertal age, represent significant exercises for the development of technical skills, such as passing, shot on goal, etc and physical aspects.

The aim of the study is to evaluate and compare the internal load and the type and frequency of use of some technical skills in different types of SSG (3v3, 4v4, 5v5) in young soccer players.

Materials and methods

The study included 10 young soccer players U17 (mean age 15,6±0,5 years, weight: 66±7,3 kg; height: 172±5 cm). Written informed consent was obtained from all subjects.

HR was assessed using wireless heart rate monitors equipped with a telemetry system (Polar Electro Oy. Kempele, Finland). The 3v3, 4v4 and 5v5 SSG was played on an 18 x 30 meter, 24 x 36 meter and 30 x 42 meter, respectively. The playing surface was composed of the latest generation of artificial turf. For the RPE the 6-20 Borg scale was used. The exercises were filmed with a camera for the next counting of technical skills. All SSG formats used a size 5 football.

The young soccer players before making the different SSG formats have followed a warm up of 15 minutes, including an aerobic activation, dynamic stretching exercises, joint mobility exercises, and running technique exercises.

The 4v4 and 5v5 formats were performed for 3 to 6 min while the 3v3 for 3 to 4 min. The recovery between series was passive for 90 sec for all types of SSG examined. During the duration of the playing sessions, heart rate was constantly monitored using wireless Polar heart rate monitors and at the end of each exercise, individually, it was requested the value of RPE.

The three types of SSG were evaluated in three different days with a recovery of 24 hours between the different training sessions.

Descriptive statistics (M±SD) were calculated for all assessed
variables; Student’s paired t-test was used to verify the existence of statistically significant differences between the average values obtained. The significance was set at p < 0.05.

**Results and discussion**

The internal load analysis results show that the 3vs3 has produced significant higher mean values of % HR max (3vs3: 87.2±3.3%; 4vs4: 83.8±3.8% p<0.05; 5vs5: 83.3±3.6% p<0.05 - Figure 1) and significant higher values of RPE (3vs3: 17.5±0.7 AU; 4vs4: 16.4±1.3 AU p<0.05; 5vs5: 15.8±1.1AU p<0.001 - Figure 2) than other SSG type.

![Figure 1](image1.png)  
**Figure 1** HR max percentage in different SSG.  
*P<0.05, 3vs3 versus 4vs4 and 5vs5

![Figure 2](image2.png)  
**Figure 2** RPE in different SSG.  
#P<0.05, 3vs3 versus 4vs4  
##P<0.001, 3vs3 versus 5vs5

In the analysis of the technical aspects the 5v5 format allows to perform the highest percentage of successful passes (76%), the lowest percentage of bad passes (24%) (Figure 3) and the higher number of tackles (59) (Figure 4). The results are summarized in Table 1. The first hypothesis of the study was to evaluate and compare the internal load by HR and RPE. In the comparison between the different exercises, observing the values of HR, shows that in 3vs3 are detected significantly higher values (p<0.05) compared to 4vs4 and 5vs5, confirming literature results, or rather that the 2vs2 and 3vs3 formats are able to reach higher intensities compared to 4vs4 and 5vs5 formats.4,29-32 In the comparison between these last two SSG type there are no significant differences.

![Figure 3](image3.png)  
**Figure 3** Percentage of successful passes and bad passes.  
*P<0.05, 3vs3 versus 4vs4 and 5vs5

![Figure 4](image4.png)  
**Figure 4** Number of tackles in different SSG.  
#P<0.05, 3vs3 versus 4vs4  
##P<0.001, 3vs3 versus 5vs5

In the comparison between these last two SSG type there are no significant differences.

The HR% values recorded in the following study, during the exercise of 3vs3, stands at 87.2±3.3% of HR max, are in agreement with other studies assessing the 3vs3, (performed with or without the presence of goalkeepers) that have reported percentages of max HR ranging between 87% and 89%.16,18,25,33,34 This values are in agreement with another study that showed during an exercise conducted in 3vs3 “cage” modality, although with smaller subjects compared to those of this study, FC values equal to 88±2.7% of HR max.35

The highest and significant values of RPE, indicated in the study during the 3vs3, confirm that this exercise is more intense and...
wasteful compared to the other SSG, that are performed with a greater number of players and larger size. The RPE values of 3vs3 (17.5±0.7) are in agreement with other studies that, however, used a larger field, a greater playing time and different age subjects (3,34). The RPE values revealed during the 4vs4 (16.3±1.3) are in agreement with other studies carried out on young players.13,14,15 The second aim of the study was to describe the type and the quantity of some technical skills in different types of SSG (3vs3, 4vs4, 5vs5).

In reference to the percentage of successful passes and bad passes, the study showed an increase percentage of successful passes when the number of players and the field sizes increased; about bad passes it was observed the opposite trend. Very probably the technical skills effectiveness was positively conditioned by the availability of a more appropriate area to formats with a greater number of players. Relatively to the parameter “tackle”, instead, it was observed an increase in the number of these latter with the increase of the players involved. Very probably the high number of players may have determined an inadequate occupation of the field space game.

The results of this study are in agreement with some similar researches20,21 and disagreement with others that show that the types of SSG with a smaller number of players can lead to an increased number of technical skills,16,17,18,19 demonstrating the need to investigate further in this direction, because there is no agreement in the literature.20 These differences can depend by the different technical skill levels of those involved. Therefore the choice of the SSG type depends on the desired objectives: that is, if you will mostly solicit the intensity of exercise, should be preferred those with a reduced number of players and smaller fields; conversely, if you want to pursue the increase of sport-specific skills, priority must be given the SSG with a greater number of players and larger fields, confirming literature values.20

Conclusion
The study results showed that among the SSG formats observed, the 3vs3 is more effective for high-intensity aerobic training, because it generates a heart response of 90% of the HR max. The increase of the number of players involved in the exercises has produced an increase in the number of specific technical skills. In conclusion, it suggests the need to monitor these types of exercises to understand, describe and modulate young athletes training load.

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Conflict of interest
Author declares there is no conflict of interest in publishing the article.

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