

Small-side games and size pitch in elite female soccer players: A short narrative review

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ABSTRACT

Introduction: In recent years, in the soccer training have found widespread diffusion the games modified by rules, use of wildcard players, configuration field, players' number, size of the playing area, defined as small-sided games or SSG. **Methodology:** For the bibliographic search PubMed and Sport Discuss databases were used selecting articles published between 01/01/2016 and 01/12/2020. Two keyword groups were identified, using synonyms and similar terms, using the operator "OR": 1) "small-sided games" OR "elite female soccer players" OR "field size" 2) "small-sided games" OR "elite female football players" OR "field size". Subsequently, all the categories were combined together using the "AND" operator. **Results:** The initial database search produced 77 results. After removing the duplicates (3), study on injury incidence (21), amateur soccer players (3), endocrine and biomechanical aspects (20), assessment preventive issue (12) and other aspects not related to performances (15), three studies were selected, analysed, and included in the narrative review. **Discussion and conclusions:** The physiological responses of female soccer players during SSGs have only been investigated relative to the players' number. The field size is considered a key factor in soccer training because the players' density conditions internal and external load. The studies analysed suggest that the most suitable format for achieving a high intensity of exercise with female soccer players, is precisely the medium field size, that is, in the case observed for 4vs4, a size equal to 24.5m x 24.5m. The load control of specific sport exercises is useful for the injury's prevention and for relevant training organization to respond to the competitions' demands.

Keywords: Small-sided games; Female soccer players; Pitch size.

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INTRODUCTION

In team sports, the staff look for exercises that are more functional than the demands of the performance model (Sedano et al., 2009; Idrizovic, 2014; Ruiz-Esteban et al., 2020; Esposito & Raiola, 2020; Elia et al., 2020; Di Domenico et al., 2019). This research is often directed towards ball exercises that can determine specific physiological adaptations (Aguiar et al., 2012; Clemente et al., 2012; Tan et al., 2012; Cronin et al., 2017; Giovanni et al., 2020; Esposito & Raiola, 2020). In recent years, in the soccer training have found widespread diffusion the games modified by rules, use of wildcard players, configuration field, players' number, size of the playing area, defined as small-sided games or SSG (Aguiar et al., 2012; Castellano et al., 2013; Halouani et al., 2014; Sannicandro & Cofano, 2018; Sannicandro, 2019; D'Isanto et al., 2019; Ceruso et al., 2019a).

These variations allow the athletes of the various open skill sports to be trained specifically (Tan et al., 2012; Raiola, 2014; Raiola, 2017; Raiola & Altavilla, 2020; Ceruso et al., 2020; Ceruso et al., 2019b). In literature the advantages deriving from the use of SSG for performance are extensively described (Sampaio et al., 2007; Folgado et al., 2018; Coutinho et al., 2018a; Sannicandro, 2019): the coaches use the SSGs both with elite soccer players, and with young players (Casamichana et al., 2013; Castellano et al., 2013; Halouani et al., 2014; Leser et al., 2019; Sannicandro & Cofano, 2018; Hill-Haas et al., 2009a; Hill-Haas et al., 2009b) because they optimize the training time (Halouani et al., 2017a; Halouani et al., 2017b; Little, 2009).

The literature provides data on the SSG organizational methods in relation to the players number and the field size (Martone et al., 2017; Hammami et al., 2018), the use of wildcard players (Sanchez-Sanchez et al., 2017; Sannicandro & Cofano, 2017a; Sannicandro & Cofano, 2017b; Sannicandro & Cofano, 2018; Sannicandro et al., 2020), the recovery times and the recovery mode (Sanchez-Sanchez et al., 2017; Sparkes et al., 2018; Sarmiento et al., 2018), but the field size configuration represents a relevant variable especially for the soccer player who is confronted with situations that are cognitive challenge (Cronin et al., 2017; Tan et al., 2012; Folgado et al., 2018; Coutinho et al., 2018a; Sannicandro, 2019).

Different spatial configurations combined with modified rules create a variability environment that activate problem solving processes during high intensity exercise. But this variability consequently determines different tactical behaviours and different motor loads (Olthof et al., 2015; Sanchez et al., 2018; Joo et al., 2016; Gonçalves et al., 2016).

From the literature it emerges that the SSGs' organization on different spaces or spaces that vary during the same exercise, imposes a different motor load and very different tactical behaviours (Sanchez-Sanchez et al., 2019; Coutinho et al., 2018b; Sannicandro, 2019; Ceruso et al., 2019c).

Some studies have been developed to better understand how spatial constraints, such as field dimensions and spatial references, can influence athletic performance, but these studies have been limited to elite male soccer players (Raiola et al., 2020; Sarmiento et al., 2018; Gonçalves et al., 2016; Olthof et al., 2015; Clemente et al., 2014; Gaudino et al., 2014).

The effects deriving from the use of these SSG executive variants is highly dependent on the players' technical level (Leser et al., 2019; Gaudino et al., 2014; Lacombe et al., 2018; Sannicandro & Cofano, 2018; Olthof et al., 2015).

An open problem remains the understanding the effects on metabolic demands and exercise intensity of SSG in female soccer training.

It remains to understand if the spatial dimensions, the athletes' density, or the field configuration can determine a variation of intensity in women's football, as well as occurs in men's football, elite and youth (Sarmiento et al., 2018; Travassos et al., 2018; Gonçalves et al., 2016; Olthof et al., 2015; Clemente et al., 2014; Sannicandro, 2019).

This aspect, therefore, will help coaches to design SSGs and training with greater accuracy, as both the players' number and pitch size seem to influence the high-intensity demand of one task.

The aim of this paper is to provide a narrative review based on field size effects on intensity training or metabolic demands in female soccer players.

MATERIAL AND METHODS

Using the PRISMA model (Moher et al., 2009), a systematic review of the literature was performed to analyse the relationship between the SSGs' field size and intensity training in female soccer training.

For the bibliographic search PubMed and Sport Discuss databases were used selecting articles published between 01/01/2016 and 01/12/2020. Two keyword groups were identified, using synonyms and similar terms, using the operator "OR": 1) "small-sided games" OR "elite female soccer players" OR "field size" 2) "small-sided games" OR "elite female football players" OR "field size". Subsequently, all the categories were combined together using the "AND" operator.

RESULTS

The initial database search produced 77 results. After removing the duplicates (3), study on injury incidence (21), amateur soccer players (3), endocrine and biomechanical aspects (20), assessment preventive issue (12) and other aspects not related to performances (15), three studies were selected, analysed, and included in the narrative review.

The studies on SSGs demonstrated that external factors, such as the number of players or touches, the length of the game, the game objectives, the field size, the players' density, and the game surface cause different physical and physiological responses, and therefore affect the duration and number of high-intensity actions or metabolic demands.

The field size seems to represent the factor that clearly affects the internal and external load parameters, such as total distance travelled and effort perception in women's football (López-Fernández et al. 2019).

The total field size (in m²) affects the values of peak heart rate, the average heart rate, and the percentage of individual maximum heart rate (López-Fernández et al., 2018).

In particular, the medium side game (600m², 75m² for each player) determines higher and statistically significant values of peak heart rate, average heart rate and percentage of maximum heart rate ($p < .05$) compared to small and large side games (López-Fernández et al., 2018).

The medium side game on natural grass and the large side game on artificial turf show the greatest decreases in countermovement jump performance, technically defined as CMJ ($p < .001$) following exercises lasting 4 minutes (López-Fernández et al., 2018).

The natural grass surface always shows higher percentage of time spent over 90-95% and over 95-100% of the maximum heart rate, in all formats, small, medium, and large (López-Fernández et al., 2018).

When measuring the external load and energy expenditure, it is observed that medium side games determine a metabolic load relative (KJ / Kg), an average metabolic power (W / Kg) and an equivalent distance (m) higher than the small-side games (López-Fernández et al., 2017).

DISCUSSION

The purpose of this narrative review was to understand how many studies have been carried out on the SSGs field size in female soccer.

The review also aimed to identify transfers for field practice to improve the training quality of elite female soccer players.

Today, SSGs are increasingly used in training because they reproduce the technical, tactical, and even physical demands of soccer matches (Bujalance-Moreno et al., 2018; Dellal et al., 2011; Clemente et al., 2012; Köklü et al., 2015; Joo et al., 2016), whilst allowing players to increase their fitness regardless of age or gender (Hill-Haas et al., 2011; Clemente et al., 2014; Halouani et al., 2014; Halouani et al., 2017b).

The research data differentiated between small, medium, and large sided games, in relation to the average space provided for each player (Clemente et al., 2019a & 2019b; Sarmiento et al. 2018).

The male soccer research has showed that the physiological responses of players in SSGs are affected by several external factors, such as the exercise length, rest type and period, field size, goalkeeper use, touches limitation, field surface, coaches' instructions, and coaches' incitements (Baptista et al., 2019; Castellano et al., 2013; Aguiar et al., 2012; Sarmiento et al., 2018; Gonçalves et al., 2016; Olthof et al., 2015; Clemente et al., 2014; Gaudino et al., 2014).

Conversely, the physiological responses of female soccer players during SSGs have only been investigated relative to the players' number (Mara et al., 2016).

The field size is considered a key factor in soccer training because the players' density conditions internal and external load (Bujalance-Moreno et al., 2018; Gonçalves et al., 2016; Coutinho et al., 2018b).

In fact, the values of heart rate mean, the percentage of individual maximum heart rate peak and heart rate peak are significantly higher ($p < .05$) in the medium sided games rather than in the small or large side games: they respectively touch average values between 90% and 94% of the maximum heart rate, between 95% and 98% of maximum heart rate and absolute peak values between 189 and 206 bpm (López-Fernández et al., 2017; López-Fernández et al., 2018).

These values would suggest that the most suitable format for achieving a high intensity of exercise, with female soccer players, is precisely the medium field size: in the case observed for 4vs4, a size equal to 24.5m x 24.5m (López-Fernández et al., 2018).

This data is consistent with the percentage decrease observed after exercise on medium side games in the explosive strength values through CMJ: between rest values and post-exercise values, there was a difference ($p < .001$) between about 4 and 8% (López-Fernández et al., 2018).

In recent years, the wide diffusion of many instruments able to quantify the activity at various run intensities such as the Global Positioning System (GPS) have provided helpful information on competition and training demands.

These instruments made it possible to better describe the metabolic effort during the SSG and confirmed that on a natural surface, it is the medium sided games that engage the players more intensely (López-Fernández et al., 2018).

The medium side games on natural surface allow peak speeds similar to those of large ones, greater distances travelled in sprints and higher number of accelerations (López-Fernández et al., 2019).

In conclusion, the field size can be used to modulate the internal and external load in SSG training with female soccer players.

In the literature, so far, only the effects of a single SSG format have been described, namely 4vs4 without goalkeepers; further research is needed to understand the effects of different SSG formats and sizes currently used in female's soccer.

The female players density, the rules' modification, the presence of wild card players and the use of other variants in the SSG requires adequate studies in female's soccer.

The load control of specific sport exercises is useful for the injury's prevention and for relevant training organization to respond to the competitions' demands (Ruiz-Esteban et al., 2020; Vescovi, 2012a and 2012b; Vescovi and Favero, 2014).

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