How manipulating task constraints in small-sided and conditioned games shapes emergence of individual and collective tactical behaviours in football: A systematic review

OMETTO, Lucas, VASCONCELLOS, Fabrício VA, CUNHA, Felipe A, TEOLDO, Israel, SOUZA, Carlos Raphael B, DUTRA, Marcio B, O'SULLIVAN, Mark and DAVIDS, Keith <http://orcid.org/0000-0003-1398-6123>

Effects of manipulating task constraints in Small-Sided and Conditioned Games on influencing the emergence of individual and collective tactical behaviours in Football: A Systematic Review

Effects of Small-Sided Conditioned Games on tactical behaviours in Football

Lucas Ometto[1,2]; Fabrício V. A. Vasconcellos[1,2], Felipe A. Cunha[1]; Israel Teoldo[3]; Carlos Raphael B. Souza[2]; Marcio B. Dutra[4], Mark O'Sullivan[5] & Keith Davids[5]

[1] Post-Graduation Program in Exercise and Sport Sciences, State University of Rio de Janeiro, Brazil; [2] Laboratory of studies in soccer, State University of Rio de Janeiro, Rio de Janeiro, Brazil; [3] Centre of Research and Studies in Soccer (NUPEF), Federal University of Viçosa (UFV), Viçosa, Brasil; [4] Master's Program in Physical Activity Sciences - Salgado de Oliveira University, Niterói, Rio de Janeiro, Brazil; [5] Centre for Sports Engineering Research (Skill Acquisition theme), Sheffield Hallam University, UK

Abstract

Background: Small Sided and Conditioned Games are characterized by modifications of field dimensions, number of players, rules of the game, manipulations used to shape the key task constraints that performers need to satisfy in practice. Evidence has already demonstrated the importance of designing practice to enhance understanding of tactical behaviours in football, but there is a lack of information about how coaches can manipulate task constraints to support tactical learning. Objective: To investigate which task constraints have been most often manipulated in studies of SSCGs; and what impact each manipulation had on emerging tactical behaviours, technical-tactical actions, and positional relationships between players. Methods: PubMed, Web of Science, Scielo, and Academic Google databases were searched for relevant reports without time limits. The criteria adopted for inclusion were: a) studies performed with soccer players; b) studies that included SSCGs as an evaluation method; c) studies that investigated tactical behaviours in SSCGs; and d), articles in English and Portuguese. Results: The electronic database search included 24 articles in the review. Of these, five manipulated field dimensions, six manipulated number of players involved, five manipulated field dimensions and number of players, five used different scoring targets, two altered the number of players and scoring target, and one manipulated the number of players, field dimension, and scoring target. Conclusion: Among the task constraints analyzed in this systematic review, manipulation of number of players and playing field dimensions concomitantly occurred most frequently. Keywords: Soccer, small sided and conditioned games, constraints, tactical behaviours, learning process.

1. Introduction

Small-sided and conditioned games (SSCGs) have been described as smaller versions of the formal game due to reduced player numbers and field dimensions (1). SSCGs were adopted as a structured coaching method by legendary Dutch coach Rinus Michels, who with Johan Cruyff built the great Ajax team of the early 1970s, and became more famous with the great Liverpool teams of the 1980s. However, there has been a re-emergent use of SSCGs in the last decade (2), with the objective of increasing player participation in training, and consequent physiological and physical overload (3, 4). The first studies of SSCGs were based on the relationship between playing area dimensions, number of players involved, and physiological effects generated (1, 5). In fact, many studies have demonstrated the capacity of SSCGs to improve players' physical condition (5-9).

More recent studies have demonstrated that, aside from improving the physical capacity of the players, SSCGs can also be designed to develop the tactical and skills components of team performance (8-10). In line with these fresh insights into their potential additional roles in practice, the design of SSCGs has undergone changes in order to emphasize the emergence of specific tactical and technical behaviours. This newly emphasised description refers to them as 'modified' versions of the formal competitive game, rather than being simplistically termed 'smaller'. These SSCGs are characterized by modifications of field dimensions, number of players involved, rules of the game (e.g., number of goal scoring targets used) (8). These manipulations are used to shape the key task constraints that performers need to satisfy in practice. The intention is to

expose players to particular situations and conditions that simulate key aspects of competitive performance. These SSCG formats can effectively exaggerate constraints of competitive performance contexts and help to potentiate specific individual technical and collective tactical behaviours, as well as to provide opportunities to experience physical, physiological, and technical demands of competition in a contextualized way (11-13).

This type of practice methodology can enhance the learning process for acquiring tactical behaviours in soccer, based on an ecological dynamics perspective, in which performance behaviours emerge from the dynamic interaction of each individual with the environment and with the task (8, 9, 14, 15). Thus, the constraints manipulations in SSCGs end up conditioning the practice games according to designs used to develop players' tactical intentions. This methodology potentiates different capacities in players to help them learn to adapt and develop different organisational structures during performance. The constraints can be exemplified as: a) environmental constraints - e.g., playing on dry/wet or hard/soft surfaces, in high or low temperatures, on natural or synthetic grass; B) task constraints - e.g., number of players involved, field dimensions and locations of play, number of goal-scoring targets used, and rules, among others; and c) individual constraints - e.g., technical, physical, chronological age groupings, fatigue status, and previous experience (8).

The manipulation of task constraints has been the most commonly reported topic in the literature, perhaps because it is the most practical constraint for coaches to adapt during everyday practice sessions. Evidence has already demonstrated the importance of task manipulation for designing practices to enhance understanding of tactical behaviours in football (1, 8, 16, 17). Some

studies have shown that manipulating task constraints allows players to explore and exploit self-organizing tendencies which they can harness during training, developing their adaptive decision making capacities (8), and improving competitive performance (16, 18, 19).

There is a need for more research investigating how coaches can manipulate task constraints to support the learning of tactical behaviours in soccer players. For example, with respect to manipulation of playing field dimensions, different outcomes can emerge. Casamichana et al. (2010) demonstrated that a reduction in field dimensions led to an increase in the number of technical actions performed by each player. Costa et al. (2012) reported that learners revealed a greater prevalence of tactical behaviours for exploiting space on field, defensive coverage, concentration, and the positioning of defenders, away from the ball, to reduce the effective play-space of the opponents in smaller playing areas. In addition, studies by Frencken et al. (2013), Silva et al. (2014), and Vilar et al. (2014) found that, the larger the dimensions of the playing field during practice, the greater the distances between players in the same team and between those players and the opposing team. Due to these methodological inconsistencies, even when the manipulation of a specific task constraint remains the same, some studies differed greatly in their results and interpretations of the findings, which may make it difficult for practitioners to use this information to guide the methodologies used in training

Thus, there is a need to develop a broader understanding of the tactical behaviours that emerge when specific task constraints are manipulated in the use of SSCGs during practice in football. In line with this perceived weakness in the extant literature, the objectives of this systematic review were to: (i) investigate

which task constraints had been most often manipulated in studies of SSCGs; and (ii), what impact each manipulation had on emerging tactical behaviours, technical-tactical actions, and positional relationships between participating players.

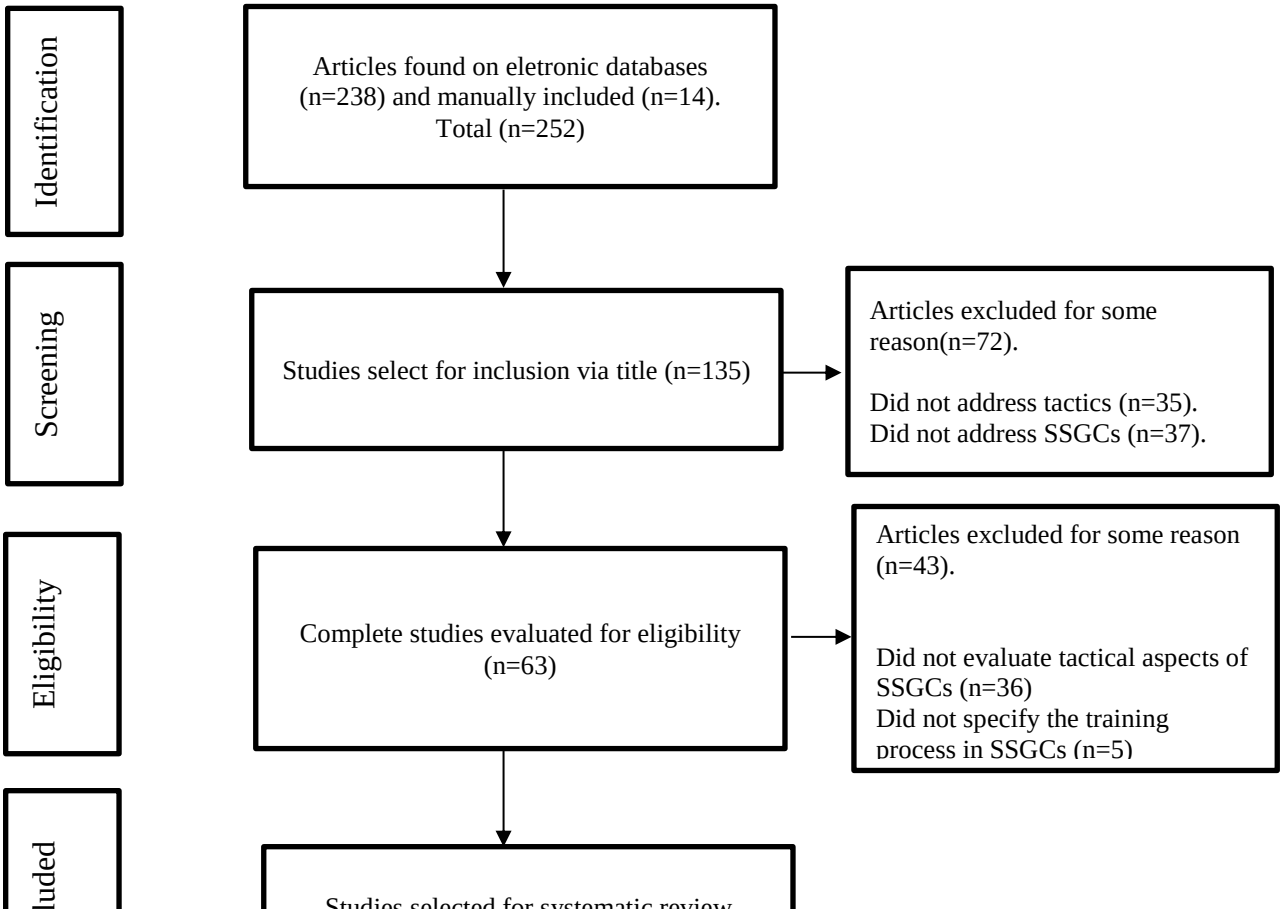
2. Methods

The literature review was performed according to the recommended guidelines for systematic reviews and PRISMA meta-analyses (24). A wide search of articles without any restriction of dates was carried out by two researchers, L.O. and D.C., on the following electronic databases: Pubmed, Web of Science, Scielo, and Academic Google, with the final search being carried out on 08/31/2017. The following search terms were used: ("tactical" or "tactical skills" or "technical- tactical" or "team behavior" or "tactical behavior" or "tactical performance" or "tactics" or "procedural knowledge" or "tactical assessment" or “tactical patterns”) AND ("football" or "soccer" or "team sports" or "small sided games" or “conditioned games”). The criteria adopted for inclusion of the studies were: a) studies performed with soccer players; b) studies that included SSCGs as a training and/or evaluation method; c) studies that investigated tactical behaviours in SSCGs; d) articles in English and Portuguese. The exclusion criteria adopted were: a) studies that addressed only the comparison between players of different divisions, ages, and practice time; b) studies that addressed only the comparison between different playing surfaces.

This systematic review included studies which evaluated positional relationships of participating players, technical-tactical actions that players used to

function in performance and tactical behaviours. For tactical behaviours we considered principles presented by Costa et al. (2011): Attacking – penetration: movement of a player with the ball towards the goal area; attacking support: attacking support for the player with the ball; depth mobility: movement of players between the last defender and goal line; width and length: movement of players to extend and use the effective play-space; attacking unity: Movement of the last line of defenders towards the attacking midfield areas, in order to provide support in attack. Defensive – delay: actions to slow down an opponent's attempt to move forward with the ball; defensive support: positioning of off-ball defenders behind the "delaying" player, providing defensive support; balance: Positioning of defenders away from the ball to track movements of attackers off the ball; concentration: positioning of defenders to occupy vital spaces and protect the scoring area; defensive unity: Positioning of defenders to reduce the opponent's effective playing space (25).

Figure 1. Flowchart showing details regarding search strategy, selection of included studies, and reasons for exclusion of studies regarding tactics in small-sided and conditioned games.



3. Results

The electronic database search found 238 potentially relevant articles, with an additional 14 that were included after a manual search of the reference list, totaling 2523 studies. 24 articles included all the inclusion and exclusion criteria, adding up to 365 participants whose tactical behaviours were studied in different SSCGs. A statistical significance level of $p \leq 0.05$ was adopted in all studies. Figure 1 demonstrates the steps in the selection process of the included articles.

Table 1 presents the descriptive characteristics of the 24 articles included in the review. Of these, five manipulated the dimensions of the playing field (20-23, 26), six manipulated the number of players (27-32), five manipulated the dimensions of the field and the number of players (33-37), five used different types of scoring targets (12, 38-41), two altered the number of players and the type of scoring target (42, 43), and one manipulated the number of players, field dimensions, and different scoring target types (7).

Table 1. Characteristics of the studies that examined the tactical behavior in small sided games and conditioned.

Author	**N**	**Age** (years)	**Competitive Level**	**Structure**	**Pitch Size** (meters)	**Time [rest]** (minutes)	**Method analysis**	**Constraints manipulated**
Casamichana et al; 2010	10	15	Non-elite	Gk+5 x 5+Gk	32 x 23 50 x 35 62 x 44	8' [5']	Video analysis	Pitch Size
Costa et al; 2010	16	13	NE	Gk+3 x 3+Gk	36 x 27	4'	FUTSAT	Different score methods
Costa et al; 2012	12	15	Non-elite	Gk+3 x 3+Gk	36 x 27 27 x 18	4'	FUTSAT	Pitch Size
Duarte et al; 2013	12	17	Elite	Gk+5 x 5+Gk	42 x 40	10' x [8']	Positional data	Defensive playing method

Frencken et al; 2013	10	22	Non-elite	Gk+4 x 4+Gk	30 x 20 (am) 24 x 20 (am) 30 x 16 (pm) 24 x 16 (pm)	8' [8']	Positional data	Pitch Size
Sampaio et al; 2013	24	20	Non-elite	Gk+5 x 4+Gk	60 x 40	3 x 5' [3']	Positional data	Player numbers (Superiority and inferiority)
Castelo et al; 2014	10	11	Non-elite	Gk+3 x 3+Gk Gk+5 x 5+Gk	36 x 27 60 x 45	4'	FUTSAT	Player numbers and pitch Size
Clemente et al; 2014	10	26	Non-elite	2x2+2 3x3+2 4x4+2	19 x 19 (day1) 23 x 23 (day2) 27 x 27 (day3)	3 x 5' [3']	Video analysis	Player number, pitch size and different score methods
Garcia et al; 2014	54	14 and 9	Elite	Gk+5 x 5+Gk Gk+7 x 7+Gk Gk+9 x 9+Gk	30 x 20 (day1) 45 x 30 (day2) 60 x 45 (day3)	20'	Video analysis	Player numbers and pitch Size
Silva Bernardo et al; 2014	18	11	Non-elite	Gk+3 x 3+Gk Gk+6 x 6+Gk	30 x 19,5 60 x 39	4'	FUTSAT	Player numbers and pitch Size
Silva Pedro et al; 2014a	20	19	Elite and Non-elite	Gk+5 x 5 Gk+5 x 4 Gk+5 x 3	47 x 30	6' [6']	Positional data	Player number and different score methods
Silva Pedro et al; 2014b	20	16 and 15	Elite and Non-elite	Gk+4 x 4+Gk	36 x 26 47 x 30 57 x 37	7' [7']	Positional data	Pitch size
Travassos et al; 2014	20	24	Elite	Gk+5 x 5+Gk	30 x 25	2 x 5' [3']	Positional data	Different score methods
Vilar et al; 2014a	15	21	Non-elite	Gk+5 x 5+Gk	28 x 14 (day1) 40 x 20 (day2) 52 x 26 (day3)	2 x 5' [2'30'']	Positional data	Pitch Size
Vilar et al; 2014b	15	19	Non-elite	Gk+5 x 5+Gk (day1) Gk+4x4+Gk+1 (day2) Gk+3x3+Gk+2 (day3)	40 x 20	5'	Positional data	Player numbers (Superiority and inferiority)
Aguiar et al; 2015	10	18	Elite	2 x 2 3 x 3 4 x 4 5 x 5	28 x 21 (day1) 35 x 26 (day2) 40 x 30 (day3) 44 x 34 (day4)	3 x 6' [1']	Positional data	Player numbers and pitch Size
Olivares et al; 2015	21	10	Non-elite	3x3	32 x 22 29,5 x 15	8'	Video analysis	Different score methods
Castellano et al; 2016	24	19	Non-elite	3 x 3 Gk+4 x 4+Gk Gk+4 x 4+Gk +2	40 x 25	6' [6']	Positional data	Player numbers (Superiority and inferiority) and different score methods
Ric et al; 2016	22	20	Elite	Gk+4 x 3+Gk Gk+5 x 4+Gk Gk+7 x 4+Gk	40 x 30	3' [4']	Positional data and FUTSAT	Player numbers (Superiority and inferiority)
Praça, et al; 2016a	18	16,4	Elite	Gk+3 x 3+Gk Gk+4 x 3+Gk	36 x 27	2 x 4' [4']	FUTSAT	Player numbers (Superiority and inferiority)

Praça, et al; 2016b	18	16,4	Elite	Gk+3 x 3+Gk Gk+4 x 3+Gk Gk+3 x 3+Gk +2	36 x 27	2 x 4' [4']	Positional data	Player numbers (Superiority and inferiority)
Figueiredo et al; 2016	16	17	Non-elite	4 x 4	36 x 27	2 x 4' [5']	Video analysis	Different score methods
Machado, et al; 2016	14	13,8	Non-elite	6 x 6 + Gk	52 x 32	30'	Video analysis	Different score methods
Silva, et al; 2016	10	15	Non-elite	3x3 4x4 5x5	36 x 28	3 x 5' [5']	Positional data	Player numbers, pitch size and different score methods

Legends: Gk – goalkeeper FUTSAT - System of Tactical Assessment in Soccer; LPM - local position measurement; GPET - game performance evaluation tool; TACTO – 2D spatial coordinates; day, day2, day3 – played in different sessions; AM and PM – ant meridiem and post meridiem; NE – not evaluated.

Of the articles analyzed, five manipulated the constraints on consecutive days (7, 23, 30, 35, 37), five carried out same-day manipulations, with an interval between constraints implementation using an activity/rest ratio of 1:1 (21, 22, 30, 33, 42), and the others did not mention how this methodological aspect was organised by investigators (12, 20, 26-29, 34, 36, 38, 39, 41, 44). Of the 24 articles, eleven performed more than one series of manipulation of the same constraint, ranging from two to three series (7, 12, 23, 28, 30, 32, 33, 37, 40, 43), the others performed only one series of manipulation of each constraint (20-22, 26, 27, 29, 34, 36, 38, 39, 41, 42, 44) 41, 43). Regarding the characteristics of the sample, participants in all the studies systematically played soccer at a technical level ranging between intermediate (teams that competed in regional championships) and advanced (teams that competed in national championships). The age of the students ranged from 11 to 26 years. For analysis of the tactical component, studies varied in the use of one of three different types of methods. Six articles used FUTSAT (26, 29, 30, 34, 36, 38), 14 articles used polar coordinates (12, 21-23, 27-30, 33, 37, 42-44), and five articles used technical-tactical video analysis (7, 20, 35, 39-41). For this review, it should be noted that FUTSAT features performance in a small-sided game (3 v 3 with goalkeepers) for

four minutes, on a field of dimensions 36m v 27m, under official soccer rules. This test sought to evaluate the players' fundamental use of tactical principles during play (25, 45, 46). The analysis of polar coordinate data from player displacement allows the identification of collective tactical aspects of performance from variables measured through the relative co-positioning of the players on the field of play (21, 47). These measurements include the spatial distribution of players on field, width (the maximum distance between players in the same team in the width axis), depth (distance between athletes closest to the top and bottom boundaries of the playing field), total area covered by the team during the game, and formation of the players in relation to the centroid of the team (47). Analysis of technical-tactical actions, based on observation of video clips of small-sided games, can involve the Team Sport Assessment Procedure (TSAP) developed by Grehaigne et al. (1997)(48). This tool is used to quantify the players' attacking performance through macro indicators related to success in the game. The Offensive Sequences Characterization System (OSCS) was created by Almeida et al. (2013)(49), which also characterizes attacking sequences of play captured in performance indicators.

3.1 Effect of pitch dimension manipulation

Table 2 presents the results of articles that analyzed the effect of manipulation of pitch dimensions. The studies that manipulated this variable included 67 participants corresponding to 17% of the sample. One study increased the pitch dimensions proportionally (width and length) (23) and four studies did not increase the pitch dimensions proportionally (20-22, 26). The results of these

studies show that manipulation of pitch dimensions changes the most frequently performed tactical behaviours (26), the distance relationship between the players in the same team and the players of the opposing team (21-23), and also the technical-tactical actions that occur in the SSCG (20, 26). As the dimensions of the field increased, players began to perform the following actions less frequently: scoring goals, dribbling, intercepting, putting the ball in play, and regaining possession of the ball (20, 26). The decrease in the dimensions of the field influenced the quality of the following tactical defensive behaviours: defensive coverage (less quality), concentration, and defensive unit (more quality) (26). However, two studies revealed that, the larger the dimensions of the field, the larger the area that was occupied by the teams. Consequently, there was a greater distance between players of the same team, as well as an increase in the distance between the players of the team in possession of the ball and their opponents (21-23).

Table 2. Effect of manipulation of pitch size in small-sized and conditioned games

Author	Task	Tactical principles	Positional data	Technical-tactical action
Casamichana et al; 2010	32 x 23 > 50 x 35 32 x 23 > 62 x 44	NE	NE	Control and shoot, clearance, putting the ball in play; Interception, control and dribble, clearance, putting the ball in play.
Costa et al; 2012	27 x 18 > 36 x 27 36 x 27 > 27 x 18	Width and length, defensive coverage, concentration, defensive unity; Balance.	NE	Loss ball of possession, regain the ball possession, ball possession of the opponent.
Frencken et al; 2013	30 x 20 > 24 x 20 > 30 x 16 and 24 x 16 24 x 16 > 30 x 16 30 x 20 > 24 x 20 < 30 x 16 < 24 x 16	NE	Inter-team distance in longitudinal and inter-team distance in lateral; Inter-team distance in lateral; Surface area difference.	NE
Silva Pedro et al; 2014	57 x 37 > 47 x 30 > 36 x 26 36 x 26 > 47 x 30 > 57 x 37	NE	Effective playing space, teams' separateness; Entropy.	NE
Vilar et al; 2014[a]	52 x 26 > 40 x 20 > 28 x 14	NE	Interpersonal distance	NE

Legend: NE = Not Evaluated

3.2 Effect of manipulation of number of players

Table 3 presents the results of the articles that analyzed the effect of the manipulation of the number of players, involving 107 participants, which represents 23% of the sample. A relevant point is that in all of the studies there were inter-team numerical differences in the games, with one of the teams having a greater number of players than the other team. The research concluded that the manipulation of this constraint led to the emergence of new behaviours patterns, both in tactical behaviours (30) and the interactions between the players (27, 28). However, when technical tactical actions were analyzed, no significant differences were observed (29).

One study showed that the team with numerical superiority performed more defensive tactical behaviours, and the team with numerical inferiority performed a greater number of penetrations of the defensive line or movements of the player with the ball towards the goal area (30). Three other studies evaluated players' ball possession in relation to their opponents; the results found that, as the numerical superiority increased (4 x 3 to 5 x 3, for example), the distance between players increased (27, 33), as did the distance to the team center (28).

Table 3. Effect of manipulation of number of players in SSCGs

Author	**Task**	**Tactical principles**	**Positional data**	**Technical tactical action**
Sampaio et al; 2013	(5x4) Superiority > inferiority	NE	Randomness in distance to team centroid, distance to team centroid.	NE
Vilar et al; 2014b	5x5 > 5x4; 5x4 > 5x3; 5x5 > 5x3 5x5 > 5x3	NE	Interpersonal distance; Relative distance to intercept a shot and relative distance to intercept a pass	NE
Ric et al; 2016	4x7 > 4x5; 4x5 > 4x3; 4x7 > 4x3	NE	NE	Exploration, unpredictability and degree of flexibility of tactical patterns
Praça, et al; 2016	3 x 3 > 4 x 3 4 x 3 > 3 x 3	Penetration; Offensive unity; Defensive coverage, defensive unity, balance	NE	NE
Praça, et al; 2016	4 x 3 > 3 x 3 > 3x3+2 4 x 3 > 3x3+2 > 3x3 3x3+2 > 3x3 > 4x3 3x3+2 > 4x3 > 3x3	NE	Length; Width; Centroid distance; LPWratio	NE
Silva, et al; 2016	5x5 > 3x3	NE	Players dispersion	NE

Legend: NE – not evaluated

3.3 Effect of manipulation of targets

Table 4 presents the results of the articles that analyzed the effect of the manipulation of the scoring targets or goals, which represented 23% of the sample, that is, 87 participants. The literature review found three types of manipulation of this constraint: change in scoring target size, number of targets involved in the practice task, and comparisons of having targets to shoot at or not. Regarding changes in target size, two articles altered this constraint, demonstrating that the reduction in the size of the targets, from 6v2m to 3v2m, increased the amount of individual actions such as player movement with the ball towards the goal and actions to slow down an opponent's attempt to move forward with the ball. Additionally, it increased the number of technical tactical actions of completion, increasing ball possession, and the frequency of when the attacking team loses possession of the ball (38). The second study by Serra-Olivares et al. (2015) compared the maintenance of ball possession and number of penetrations between constraints in SSCGs involving mini goals, compared to SSCGs where the aim was to maintain ball possession and dribble across a goal line. There was no difference between the variables in maintenance of ball possession and number of penetrations. Two other studies manipulated the number of scoring targets, increasing the number of targets from two to six. The study by Travassos et al. (2014) pointed out that a greater number of scoring targets caused the ball to remain longer in the lateral areas of the field and defensive sector. Also, according to pitch location the teams began to be move further apart from each other. The Figueiredo et al. (2016) study found no difference in the length of time the ball remained in the lateral areas, but it did report an increase in the number of shots on goal in the SSCG with the greatest

number of goal scoring targets (40). Only one study compared the performance of SSCGs with and without scoring targets, the aim of which was for players to maintain ball possession (41). The study found that in SSCGs with the aim of maintaining ball possession, the following variables increased in value: time in possession of the ball, number of players involved in each attack, number of ball touches per player, and number of completed passes. In addition there was a reported increase in the quotient of ratios for the following relationships: passes completed/length of duration of ball possession, passes completed/players involved in the move, and passes completed/number of ball touches taken by each player involved.

Table 4. Effect of manipulation of game targets in SSCGs

Author	**Task**	**Tactical principles**	**Positional data**	**Technical tactical action**
Costa et al; 2010	3 x 2 > 6 x 2 (meters)	Penetration, width and length, offensive unity, delay, concentration.	NE	Shoot a goal, keep possession of the ball, regain the ball possession, shoot at opponent's goal.
Travassos et al; 2014	6 scoring > 2 scoring targets 2 scoring > 6 scoring	NE	Total time – corridor left/right, defensive sector; full pitch, left/right and central corridors– DistCG; defensive sector– DistCG and RelSTI; Total time - central sector.	NE
Olivares et al; 2015	Mini goal and cross end line	NE	NE	No significant differences: game performance in keeping possession of the ball; game performance in penetrating the defense.
Figueiredo et al; 2016	6 scoring > 2 scoring	NE	NE	Shoot a goal.

Machado et al; 2016	Maintenance of ball possession > progression to the target game Progression to the target game > maintenance of ball possession	NE	NE	Duration of ball possession, players involved, ball touches, passes, passes/duration, passes/players involved, passes/ball touches; Ball touches/players involved.

Legend: NE = Not Evaluated

3.4. Effect of manipulation of two or more constraints

Table 5 displays the results of the articles that analyzed the effect of manipulation of two (31, 33-36, 41, 42, 51) or more constraints in the SSCGs (7), representing 32% of the sample, totaling 156 participants. Of the studies that manipulated two constraints, four manipulated the number of players involved and field dimensions. Of these, three articles did not increase field dimensions proportionally; in other words, they increased the area (square meters - m2) in which each player had to play (34-36). These articles showed that when the number of players on field decreased, there was a concomitant increase in the number of movements of the player with the ball towards the goal area and the defensive actions to slow down an opponent's attempt to move forward with the ball (34, 36), furthermore an increase the defensive support, positioning of defenders away from the ball to track movements of attackers off the ball and movement of the last line of defenders towards the attacking midfield areas, in order to provide support in attack (34, 36). Concerning technical-tactical actions, the same studies demonstrated that, a smaller number of players in the field increased the frequency of individual actions such as number of ball touches

taken, passes completed, completions, and dribbles (34, 35). A larger number of players involved in SSCGs increased collective actions, loss of ball possession, and maintenance of the ball (36). Only one study maintained a proportional relationship between field dimensions and number of players (37). It was found that a greater number of players generated a greater distance from the players to the team center (37). Still, in studies that manipulated two constraints, one article evaluated the manipulation of the number of players involved and scoring targets. This study found that numerical inferiority in a team generated a greater distance of the players in the attacking line from the players in the defensive line and in the team with numerical superiority, the study showed an increase in the attacker-defender line distance value under task constraints of using a central goal and the three mini goals (42).

Just one study have manipulated of three constraints, number of targets, number of players and pitch size. This study found that games with fewer players generated a greater volume of play, i.e. the frequency of ball possession during match, and a better performance independently of the target type (7).

Table 5 - Manipulation of two or more constraints in SSCGs

Author	Task constraints manipulated		Tactical principles	Positional data	Technical tactical action
Castelao et al; 2014	Player numbers and pitch size	3x3 > 5x5 5x5 > 3x3	Penetration and delay; Offensive unity and balance	NE	Shoot a goal
Clemente et al; 2014	Different methods of scoring, player numbers and pitch size	Cross the end line Two goals One goal	NE	NE	Volume of play: 2x2 > 3x3 > 4x4, Performance score: 2x2 > 3x3 and 4x4; Attacks with ball: 2x2 > 3x3 and 4x4 Volume of play: 2x2 > 3x3 and 4x4; Performance score: 2x2 > 3x3 and 4x4; Volume of play: 2x2 > 4x4; Performance score: – 2x2 > 4x4.
Garcia et al; 2014	Player numbers and pitch size	5x5 > 7x7; 7x7 > 9x9; 5x5 > 9x9	NE	NE	Touches per game, average of touches per outfield player, number of attempts, attempt dribbles, number of attempt passes.
Silva Bernardo et al; 2014	Player numbers and pitch size	3x3 > 6x6 6x6 > 3x3	Penetration, depth mobility, delay, and defensive unity; Offensive unity, defensive coverage, balance.	NE	Shoot a goal. Maintenance of ball possession, loss of ball possession, opponent ball possession.
Silva Pedro et al; 2014	Player numbers, different score methods	5x3 > 5x4; 5x4 > 5x5; 5x3 > 5x5	NE	CdtM, CdtG, dtH2, dtV1	NE

Aguiar et al; 2015	Player numbers and pitch size	5x5 > 4x4; 4x4 > 3x3; 3x3 > 2x2; 4x4 > 2x2; 5x5 > 2x2	NE	Team centroid, opponent centroid.	NE
Silva, et al; 2016	Player numbers, pitch size and different score methods	5x5 > 4x4 > 3x3	NE	Players dispersion	
Castellano, et al; 2016	Player numbers and different score methods	Two goals and Goal + 2 floaters > Goal Goal > two goals and goal + 2 floaters	NE	Width – defensive; Length and width– attack; team separation.	Ball possession.

Key: Distance from center of team to mini goals; CdtG – distance from center of team to central goal; dtv1- distance between left and right sidelines; dtH2 – distance between the last forward and the last defender; NE – Not Evaluated

4. Discussion

The objective of this systematic review was to identify in the literature the effects of manipulating task constraints on tactical behaviours that emerged in SSCGs. The main finding in this study was that most investigations of SSCGs tended to manipulate two or more constraints, evidenced by the greater number of articles published, and the larger sample size. This observation corroborates the findings of earlier studies of performance in SSCGs that also evaluated the impact of manipulating more than one constraint (e.g., pitch dimension and number of players) on physiological parameters (1, 5, 17). The studies on the tactical components of performance in the SSCGs seem to have followed the same logic, since the maintenance of the number of scoring targets and the rules retained the nature of the formal game (1). The manipulation of constraints on number of players, pitch dimension, and game objectives did not reveal any differences in the number of articles found (five articles for each constraint); however, they comprised a small number in relation to the total sample.

SSCGs have been widely used by coaches to teach/train tactical behaviours inherent to soccer, helping players to understand performance requirements in different sub-phases of play (8). One of the most important benefits of SSCGs is in providing coaches with opportunities to manipulate task constraints and develop tactical intentionality in players in different sub-phases. The development of tactical performance behaviours depends on task design, i.e. the SSCG serves as a facilitator enabling players to reproduce the behaviours

taught by the coaches in a stochastic environment where there is 'repetition without repetition' (8).

In this context, one of the most manipulated constraints, either alone or in combination with another constraint, has been field dimensions (20-23, 26, 34-37). This manipulation was noted often in the literature as influencing the physiological demands of the SSCG (50, 51). This bias also influenced the choice of this constraint in the study of tactical aspects. Thus, when analyzing the studies that sought to identify the effect of manipulation of pitch dimensions in isolation (20-23, 26), it can be verified that in games practiced on fields of smaller dimensions, there emerged an increase in the frequency of tactical-technical actions such as: play completions, ball control, dribbling, interception, and maintenance and loss of ball possession (20, 26). This change to action frequencies emerged because in smaller playing areas, players have greater proximity during the SSCGs (21-23), thus being in contact with the ball a greater number of times, making the game more dynamic. In addition, with a shorter distance between the players and the scoring target, there is an increase in the number of move completions (goals scored).

On the other hand, despite the increase in technical-tactical actions, the study by Costa et al. (2012) showed that there was an increase in the amount of ball possession lost, showing that the proximity between the players generated greater difficulty in performing the actions, reducing the efficiency of technical-tactical actions, and leading to more interruptions in the game. The shorter distances between players, the need to cover a smaller area of play, and a shorter playing time clarifies why SSCGs performed on smaller fields also led to lower HR values in participants (50, 51). Therefore, the use of a smaller field dimension

can potentiate certain technical tactical behaviours in a game, improving each player's relationship with the ball, increasing the ability to make quick decisions, and generating less of a physiological impact (50, 51).

Studies that investigated the increase in pitch dimension demonstrated a concomitant increase in effective team play space and distance between teams (22). This collective behaviour caused a decrease in emergence of technical-tactical actions such as dribbling and shot completion (20, 26). This is because a greater distance between the players and the scoring target lessens the chance of a shot completion, and increasing the distance between the players decreases the affordances for (opportunities for) dribbling with the ball (52). Furthermore, due to the need to manage larger game spaces, increasing the dimension of the field generates greater physiological effort by the players (50, 51).

Another constraint that was also analyzed in the studies was the change in the number of players involved in an SSCG, with a numerical imbalance in the competing teams (termed overloading) (27-30, 33). The main objective of this manipulation is to constrain the actions of both the numerically superior and the numerically inferior team, causing them to develop a greater capacity for identifying and solving problems arising from the constraints of the SSCG. These studies demonstrated that there was an increase in interpersonal distance values between the attacking and defending players, caused by the tendency of the numerically inferior team to retreat into their own half of the field and to stay close to their goal in order to protect it (27, 29). This behaviour is an attempt to reducing the playing area for the team in possession (relationship between width and depth), in addition to causing a more stable positioning game, where players tend to not change positions (28, 29). Another important factor is the need of the

defending team to increase their level of attention to solve more complex problems, since numerical inferiority will increase the chances of the opposing team scoring goals (12). On the other hand, despite the reduction of effective playing space, the study by Hill Haas et al. (2011) demonstrated that numerical inferiority increases the total distance traveled by the players. Consequently there is a concomitant increase in the players' subjective perception of effort and heart rate values (53).

The numerically superior teams, however, were able to increase the frequency of the performance of defensive actions, both in and out of the center of play (i.e. an imaginary circle with the ball as a center: on a regulation size pitch the center of play is 9.15m) (29, 32). In addition, the difference between the number of players in each team increased the distance between the teams (27, 28), generating more time for players' decision- making in the attacking phase, increasing the possibilities for attacking actions (23). Thus, the manipulation of this constraint entails the manifestation of specific tactical principles of play: in the defensive phase, by reducing the space between the players and by hindering the attacking actions of the opponent, and in the attacking phase, by seeking to increase the space between the players to facilitate the attacking actions and trying to disrupt the opposing team.

Studies that have sought to simultaneously identify effects of field dimension manipulation and number of players involved (34-37), have revealed that SSCGs in playing areas of smaller dimensions, with fewer players involved, constrained participants to stay closer to each other (37). These constraints led to a greater number of confrontations between attacking and defensive players, increasing the performance of fundamental tactical behaviours directly related to

contesting the ball, pressurising opponents and breaking lines (34, 36). In addition, fewer players on a smaller field increased the frequency of technical-tactical actions performed by each player. This emerged because of the need to create passing angles near the game center in order to support the player on the ball, and by doing so facilitate maintenance of ball possession (34-36). The greater number of actions near, and in, the game center increases the intensity of the SSCGs, making games with smaller numbers of players, and on fields of smaller dimensions, lead to increases in heart rate, blood lactate concentration, and subjective perception of effort (5).

Therefore, manipulation of these constraints needs to vary depending on the specific goals of the coaching staff. If the objective is to develop each player's tactical-technical skills, it is probably best to design SSCGs with a smaller number of players on a smaller field. If the objective is to develop collective skills and/or specific knowledge of the game, perhaps it would be best to involve more players and to increase field dimensions.

Other studies have sought to identify how changes in scoring target constraints modify the tactical principles used by teams in SSCGs (7, 12, 38-41). The results confirmed that use of different types of scoring targets modifies spatio-temporal interactions between players and promotes differences in field areas explored by players to achieve performance objectives, such as penetrating defensive areas and maintaining ball possession (7, 12, 38). When the game is played with only one central goal on each side the space between competing teams is smaller, and the majority of actions take place in the central corridor of the field (7, 12). This tactical pattern emerges because an SSCG with only one goal leads to the ball staying longer in the central corridor adjacent to the scoring

target in order to reach the goal more easily. In addition, depending on scoring target size (e.g., when it is close to official size), players seek to remain closer to an immediate opponent to prevent long-range shots at goal. On the other hand, use of additional mini goals on the goal line near the sidelines causes teams to stay farther away from each other, reducing pressure on the opposition defensive area and the central corridor (7, 12). This task design causes defensive actions to emerge more frequently in the defensive sector and in the lateral corridors of the field, thus altering the most influential zones of the game (7), which in turn entails the execution of attacking actions in the defensive area of the field (12). Use of a greater number of scoring targets provokes an increase in the attention of the players, since it increases the amount of information perceived by them, which can facilitate the teaching-learning process of specific tactical principles (12).

So far, there is a limited understanding on how the manipulation of task constraints interacts with players' ability and age, considering that the studies' methods and purposes differ greatly. The studies carried out by Vilar et al. (2014) and Praça et al. (2016), for example, evaluated the manipulation of the players' numbers in SSGCs and used the polar coordinate method, with different age groups. In the Vilar et al. (2014) study the participants were non-elite players of 19 years old , while Praça et al. (2016) study were elite players of 16 year old; however, the numerical superiority used in each study was also different [e.g. Vilar et al. (2014): 5x5, 5x4, 5x3; Praça et al. (2016): 3x3 + 2], which makes it impossible to identify whether the different results happened due to age, competitive level, or numerical superiority.

However, Mendez-Villanueva and colleagues point out that the age of the players may influence the results of the studies, considering that younger

participants may have more difficulties in covering the same spatial dimension per unit of time than older participants due to body size, physical and maturational differences(54). On the other hand, the more qualified players, that is to say, with a higher competitive level, seem to exploit the available space in a different way, which facilitates teamwork, identifies a greater number of possibilities for certain actions and, therefore, solves the problems in a faster and more efficient way, besides being more difficult to mark, considering that they have better technical skills (22, 42). This information can be useful to adapt the manipulation of the task constraints to the age and the competitive level of the players, in order to optimize the skills acquisition and provide appropriate information to each age and competitive level of the teams to be trained.

Table 6 presents the main results regarding the manipulation of each type of task constraint. This table represents an important guide for soccer coaches who intend to use task constraints manipulation in their coaching.

Table 6. How manipulation of the constraints influenced tactical behavior, positional relationships, and technical-tactical actions

	Constraints	**Tactical Behavior**	**Positional Relationships**	**Technical-tactical actions**
Two or more constrains	Increase in field size and number of players	Increase in nº of offensive unity and balance	Increase in distance from center of team, and increase in distance from center of opposing team*	Decreased nº of technical-tactical actions per player
	Reduction in field size and number of players	Increased nº of penetration and restraint	Approach between the two teams	Increased nº of technical actions per player
Field size	Increase in field size	Greater amount of tactical balance behaviors	Increased number of tactical behaviors, increased distance between players and area occupied by the team, facilitating the making of balance decisions	Decreased number of technical-tactical actions per player
	Decrease in field size	Greater amount of tactical space behaviors, defensive coverage, concentration, and defensive unit *	Reduced distance between the players of the same team and the opposing team, increased the actions of	Increased number of interruptions in the game, decreased effective playing time

			dribbling and made decision-making difficult	
Number of players	Numerical superiority	Greater amount of tactical space behaviors, defensive coverage, concentration, and defensive unit*	Increased the distace of players on the same team	Greater time to perform certain technical-tactical action
	Numerical inferiority	Greater amount of tactical principles of penetration*	Increased the distance between teams; increased time in the lateral corridors	Increase in dribbling actions
Game targets	Increase in quanity of targets	NE	Increased the distance between teams; increased time in the lateral corridors	Increased number of completions
	Decrease in quantity of targets	NE	Increased time in central corridor	Decreased number of completions
	Increase in target size	NE	Increased proximity between players	Increased number of completions
	Decrease in target size	Greater amount of tactical principles of penetration, space, offensive unit, containment, and concentration	Increased defensive actions in the defensive field, decreased the chances of offensive actions	Increased maintainance of ball possession

Key: NE – not evaluated; * - just one study observed this result

Some limitations of the present study should be mentioned. The 24 studies included in this review offered much variation regarding their objectives, samples studied, and tactical behaviour evaluation methods. These variations may have influenced the results of each study, with some studies finding statistically significant differences only related to their specific objectives, without finding effects for other variables. This question can be particularly important because researchers be making the mistake of seeing only what they want; that is, choosing methods that prove what they want to show, thus skewing the results. Moreover, since there is still no consensus in the literature about the tactical principles of football, and often these are mixed with technical-tactical actions, a great variety of evaluation methods are used. This makes it almost impossible, in the current state of the art, to compare studies, even if they have the same sample characteristics and / or have manipulated the same constraint. Future studies, with the aim of overcoming these limitations, should arrive at an understanding of

what tactical principles, technical-tactical actions and positioning data are, in the different age groups and competitive levels, so that even if different assessment methods are used, the studies can contribute to deepen the knowledge about the manipulation of task constrains in the soccer. However, the use of technology has helped significantly to advance this type of knowledge. The use of polar coordinates, GPS and network analysis, can help to explain this phenomenon better, understand the teams as superorganisms, define and conceptualize tactical principles and technical-tactical actions, in this way a better comparison between studies can occur.

Another important limitation is that there are few longitudinal studies evaluating the effects of SSGCs on tactical behaviour; that is, identifying after how many training sessions using SSGCs, soccer players begin to develop certain specific individual and collective tactical behaviours. This would result in a better understanding of the real effect of manipulating task constraints, without taking into account individual aspects (competitive level, age, technical ability) for the development of individual and collective tactical aspects. Another limitation was that the present review did not aim to control the sample by taking into account the players' ages, performance level, or prior experience. It is recommended that future systematic reviews take these factors into account.

5. Conclusion

Despite the diversity of task constraints, sample, and goal assessment methods, it is important to note that the present systematic review found possible effects on the tactical components of performance by manipulation of key task

constraints in soccer practice. The results revealed that manipulation of task constraints seems to be an effective strategy for creating practice environments that facilitate the acquisition of specific tactical principles, as much for individual soccer players as for athletes performing collectively. More research is needed on the vital aspect of implementing a constraints-based methodology in practice in order to assess reliability of pedagogical principles.

Among the task constraints analyzed in this systematic review, manipulation of the number of players and playing field dimensions occurred most frequently. In this context, a greater understanding on the part of the coaches as to which task constraints should be manipulated seems to be necessary for a better implementation and progression of the exercises during training throughout the season. And lastly, another important factor for coaches to understand concerns which constraints should be manipulated to allow for the emergence of specific tactical principles according to the tactical learning objectives in a particular training session.

6. References

1. Hill-Haas SV, Dawson B, Impellizzeri FM, Coutts AJ. Physiology of small-sided games training in football. Sports medicine. 2011;41(3):199-220.
2. Clemente FM. Small-Sided and Conditioned Games in Soccer Training: The Science and Practical Applications: Springer; 2016.
3. Dellal A, Owen A, Wong DP, Krustrup P, van Exsel M, Mallo J. Technical and physical demands of small vs. large sided games in relation to playing position in elite soccer. Human movement science. 2012;31(4):957-69.
4. Castellano J, Casamichana D, Dellal A. Influence of game format and number of players on heart rate responses and physical demands in small-sided soccer games. The Journal of Strength & Conditioning Research. 2013;27(5):1295-303.
5. Halouani J, Chtourou H, Gabbett T, Chaouachi A, Chamari K. Small-sided games in team sports training: A brief review. The Journal of Strength & Conditioning Research. 2014;28(12):3594-618.
6. Reilly T, White C. Small-sided games as an alternative to interval-training for soccer players. Science and football V. 2005:355-8.
7. Clemente FM, Wong DP, Martins FML, Mendes RS. Acute effects of the number of players and scoring method on physiological, physical, and technical performance in small-sided soccer games. Research in Sports Medicine. 2014;22(4):380-97.
8. Davids K, Araújo D, Correia V, Vilar L. How small-sided and conditioned games enhance acquisition of movement and decision-making skills. Exercise and sport sciences reviews. 2013;41(3):154-61.
9. Chow JY, Davids K, Button C, Shuttleworth R, Renshaw I, Araujo D. Nonlinear pedagogy: a constraints-led framework for understanding emergence of game play and movement skills. Nonlinear dynamics, psychology, and life sciences. 2006;10(1):71-103.
10. Davids K, Button C, Araújo D, Renshaw I, Hristovski R. Movement models from sports provide representative task constraints for studying adaptive behavior in human movement systems. Adaptive behavior. 2006;14(1):73-95.
11. Hill-Haas SV, Rowsell GJ, Dawson BT, Coutts AJ. Acute physiological responses and time-motion characteristics of two small-sided training regimes in youth soccer players. The Journal of Strength & Conditioning Research. 2009;23(1):111-5.
12. Travassos B, Gonçalves B, Marcelino R, Monteiro R, Sampaio J. How perceiving additional targets modifies teams' tactical behavior during football small-sided games. Human movement science. 2014;38:241-50.
13. López LMG, Jordán ORC, Penney D, Chandler T. The role of transfer in games teaching: Implications for the development of the sports curriculum. European Physical Education Review. 2009;15(1):47-63.
14. Brymer E, Davids K. Experiential learning as a constraint-led process: An ecological dynamics perspective. Journal of Adventure Education & Outdoor Learning. 2014;14(2):103-17.
15. Vilar L, Araújo D, Davids K, Travassos B. Constraints on competitive performance of attacker–defender dyads in team sports. Journal of Sports Sciences. 2012;30(5):459-69.
16. Davids K, Araújo D, Hristovski R, Passos P, Chow JY. Ecological dynamics and motor learning design in sport. Skill acquisition in sport: Research, theory & practice. 2012:112-30.

17. Aguiar M, Botelho G, Lago C, Maças V, Sampaio J. A review on the effects of soccer small-sided games. Journal of human kinetics. 2012;33:103-13.
18. Passos P, Cordovil R, Fernandes O, Barreiros J. Perceiving affordances in rugby union. Journal of sports sciences. 2012;30(11):1175-82.
19. Vilar L, Araújo D, Davids K, Renshaw I. The need for 'representative task design'in evaluating efficacy of skills tests in sport: A comment on Russell, Benton and Kingsley (2010). Journal of sports sciences. 2012;30(16):1727-30.
20. Casamichana D, Castellano J. Time–motion, heart rate, perceptual and motor behaviour demands in small-sides soccer games: Effects of pitch size. Journal of sports sciences. 2010;28(14):1615-23.
21. Frencken W, Van Der Plaats J, Visscher C, Lemmink K. Size matters: Pitch dimensions constrain interactive team behaviour in soccer. Journal of systems science and complexity. 2013;26(1):85-93.
22. Silva P, Duarte R, Sampaio J, Aguiar P, Davids K, Araújo D, et al. Field dimension and skill level constrain team tactical behaviours in small-sided and conditioned games in football. Journal of sports sciences. 2014;32(20):1888-96.
23. Vilar L, Duarte R, Silva P, Chow JY, Davids K. The influence of pitch dimensions on performance during small-sided and conditioned soccer games. Journal of sports sciences. 2014;32(19):1751-9.
24. Moher D, Liberati A, Tetzlaff J, Altman DG, Prisma G. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS med. 2009;6(7):e1000097.
25. Costa IT, Garganta J, Greco PJ, Mesquita I, Maia J. System of tactical assessment in Soccer (FUT-SAT): Development and preliminary validation. Motricidade. 2011;7(1):69-84.
26. Costa IT, Garganta J, Grego PJ, Mesquita I, Muller E. Relationship between pitch size and tactical behavior of soccer player. Revista Brasileira de Educação Física e Esporte. 2011;25(1):79-96.
27. Vilar L, Esteves P, Travassos B, Passos P, Lago-Peñas C, Davids K. Varying numbers of players in small-sided soccer games modifies action opportunities during training. International Journal of Sports Science and Coaching. 2014;9(5):1007-18.
28. Sampaio JE, Lago C, Gonçalves B, Maçãs VM, Leite N. Effects of pacing, status and unbalance in time motion variables, heart rate and tactical behaviour when playing 5-a-side football small-sided games. Journal of Science and Medicine in Sport. 2014;17(2):229-33.
29. Ric A, Hristovski R, Gonçalves B, Torres L, Sampaio J, Torrents C. Timescales for exploratory tactical behaviour in football small-sided games. Journal of sports sciences. 2016:1-8.
30. Praça GM, Folgado H, Andrade AGPd, Greco PJ. Influence of additional players on collective tactical behavior in small-sided soccer games. Revista Brasileira de Cineantropometria & Desempenho Humano. 2016;18(1):62-71.
31. Silva P, Vilar L, Davids K, Araújo D, Garganta J. Sports teams as complex adaptive systems: manipulating player numbers shapes behaviours during football small-sided games. SpringerPlus. 2016;5(1):191.
32. Praça GM, Costa CLA, Costa FF. Tactical behavior in soccer small sided games: influence of tactical knowledge and numerical superiority. Revista da educação física/UEM. 2016.

33. Silva P, Vilar L, Davids K, Araújo D, Garganta J. Sports teams as complex adaptive systems: manipulating player numbers shapes behaviours during football small-sided games. SpringerPlus. 2016;5(1):1.
34. Castelão D, Garganta J, Santos R, Teoldo I. Comparison of tactical behaviour and performance of youth soccer players in 3v3 and 5v5 small-sided games. International Journal of Performance Analysis in Sport. 2014;14(3):801-13.
35. Garcia JD-C, Refoyo Román I, Calleja-González J, Dellal A. Quantification and Analysis of Offensive Situations in Different Formats of Sided Games In Soccer. Journal of human kinetics. 2014;44(1):193-201.
36. Silva B, Garganta J, Santos R, Teoldo I. Comparing tactical behaviour of soccer players in 3 vs. 3 and 6 vs. 6 Small-Sided Games. Journal of human kinetics. 2014;41(1):191-202.
37. Aguiar M, Gonçalves B, Botelho G, Lemmink K, Sampaio J. Footballers' movement behaviour during 2-, 3-, 4-and 5-a-side small-sided games. Journal of sports sciences. 2015;33(12):1259-66.
38. Costa I, Garganta J, Greco P, Mesquita I, Silva B, Müller E, et al. Analysis of tactical behaviours in small-sided soccer games: comparative study between goalposts of society soccer and futsal. Open sports sciences journal. 2010;3:10-2.
39. Serra-Olivares J, González-Víllora S, García-López LM, Araújo D. Game-based approaches' pedagogical principles: Exploring task constraints in youth soccer. Journal of human kinetics. 2015;46(1):251-61.
40. Figueiredo DH, Figueiredo DH, Rodrigues AB, de Oliveira Matta M. Analysis of targets settings chenges in the tactical behavior in a smaller and conditionated field. RBFF-Revista Brasileira de Futsal e Futebol. 2016;8(28):77-82.
41. Machado JC, Alcântara C, Palheta C, Santos JOLd, Barreira D, Scaglia AJ. The influence of rules manipulation on offensive patterns during small-sided and conditioned games in football. Motriz: Revista de Educação Física. 2016;22(4):290-8.
42. Silva P, Travassos B, Vilar L, Aguiar P, Davids K, Araújo D, et al. Numerical relations and skill level constrain co-adaptive behaviors of agents in sports teams. PloS one. 2014;9(9):e107112.
43. Castellano J, Silva P, Usabiaga O, Barreira D. The influence of scoring targets and outer-floaters on attacking and defending team dispersion, shape and creation of space during small-sided soccer games. Journal of Human Kinetics. 2016;51(1):153-63.
44. Duarte R, Travassos B, Araújo D, Richardson M. The influence of manipulating the defensive playing method on collective synchrony of football teams. Performance analysis of sport IX. 2013.
45. Costa I, Garganta J, Greco P, Mesquita I. System of tactical assessment in Soccer (FUT-SAT): Development and preliminary validation. Revista Mineira de Educação Física. 2009;17(2):36-64.
46. Costa ITd, Garganta J, Greco PJ, Mesquita I. Proposal for tactical assessment of soccer player's behaviour, regarding core principles of the game. Motriz rev educ fís(Impr). 2011;17(3):511-24.
47. Folgado H, Lemmink KAPM, Frencken W, Sampaio J. Length, width and centroid distance as measures of teams tactical performance in youth football. European Journal of Sport Science. 2014;14(sup1):S487-S92.
48. Grehaigne J-F, Bouthier D, David B. Dynamic-system analysis of opponent relationships in collective actions in soccer. Journal of Sports Sciences. 1997;15(2):137-49.

49. Almeida CH, Ferreira AP, Volossovitch A. Offensive sequences in youth soccer: effects of experience and small-sided games. Journal of human kinetics. 2013;36(1):97-106.
50. Williams K, Owen A. The impact of player numbers on the physiological responses to small sided games. J Sports Sci Med. 2007;6(Suppl 10):100.
51. Rampinini E, Impellizzeri FM, Castagna C, Abt G, Chamari K, Sassi A, et al. Factors influencing physiological responses to small-sided soccer games. Journal of sports sciences. 2007;25(6):659-66.
52. Duarte R, Araújo D, Gazimba V, Fernandes O, Folgado H, Marmeleira J, et al. The ecological dynamics of 1v1 sub-phases in association football. The Open Sports Sciences Journal 2010;3:16-8.
53. Hill-Haas SV, Coutts AJ, Dawson BT, Rowsell GJ. Time-motion characteristics and physiological responses of small-sided games in elite youth players: the influence of player number and rule changes. The journal of strength & conditioning research. 2010;24(8):2149-56.
54. Mendez-Villanueva A, Buchheit M, Simpson B, Bourdon PC. Match play intensity distribution in youth soccer. International Journal of Sports Medicine. 2013;34(02):101-10.