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THE EFFECTS OF SMALL-SIDED SOCCER GAMES ON TECHNICAL ACTIONS AND SKILLS: A SYSTEMATIC REVIEW

review paper
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ABSTRACT

Purpose. This systematic review aims to describe evidence of the effects of different small-sided soccer games (SSGs) on technical actions and technical performance. The article systematically reviews and organizes the effects of the most common task conditions and characterizes the methodologies employed in previous studies.

Methods. A systematic review of Web of Science, PubMed, and SPORTDiscus databases was conducted in accordance with preferred reporting items for systematic reviews and meta-analyses (PRISMA) guidelines. The search returned 339 records. After screening against the set criteria, a total of 37 full articles were fully reviewed.

Results. The main topics related to consequences of technical actions were (1) effects of different formats; (2) effects of different pitch sizes, relative area per player, pitch restrictions and configurations; (3) effects of different task conditions; (4) effects of age group, experience, and technical skill; and (5) effects of different training regimens or structured training programs. Briefly, it was concluded that smaller formats meaningfully increased the number of determinant technical actions performed when compared with medium and larger formats (5 vs. 5 to 11 vs. 11). Furthermore, smaller amounts of relative area per player meaningfully increased most technical actions made by players. The use of free play increased the number of technical actions taken, while imposing a 1-touch limitation raised the number of involvements but also the frequencies of errors and balls lost.

Conclusions. This systematic review reveals that each of the above-mentioned topics has a meaningful impact on the frequencies of technical actions and success during SSGs.

Key words: association football, performance, drill-based games, conditioned games, small-sided games, skills

Introduction

Small-sided games (SSGs) are small and conditioned versions of the formal format of play and have been progressively growing in terms of their application and related research in soccer [1, 2]. These games apply to training contexts mainly because they allow the perceptions of players to be augmented for specific behaviours [3]. Moreover, it is also possible at the same time to develop tactical behaviours and technical actions, providing consequences in psychobiological responses during games [4]. Such multidimensional effects of SSGs on players' acute responses make these games highly popular and often used by coaches for players of different age groups, experience levels, and competitive levels [5, 6].

The representativeness of SSGs, considering the formal game format, allows the chaotic effect of soccer to be simplified without compromising the essential characteristics of the game or its dynamic and complex nature [7]. In fact, SSGs allow players to repeat without repeating. That is, players are exposed to given task conditions that augment their perceptions of specific behaviours without having to repeat

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mechanical actions, which is often the case in analytical training (i.e., skill-based drills) [8]. Naturally, because the dynamics of the game is maintained during SSGs, the games influence the emergence of different adaptive behaviours during the game, thus leading to a low-to-moderate reproducibility of the technical actions performed during SSGs [5]. Nevertheless, it is expected that changes in different task conditions may have different effects on players' technical performance.

Different conditions can be used in SSGs to adjust tasks to meet the coach's objectives and the players' needs. However, conditions should be manipulated carefully. In research on SSGs, the following variables are commonly manipulated [1]: (1) format of play (i.e., the number of players involved and the numerical relationship between teams); (2) pitch size (i.e., the width and length of the pitch and their relationship, the relative mean area per player, and the restrictions or configurations of the pitch); (3) goal characteristics (i.e., the use of either formal or smaller goals with or without goalkeepers and the use of different scoring methods); (4) rule modifications (e.g., limiting the number of consecutive touches on the ball allowed; using or not using the offside rule; the use of different types of defensive markings); (5) training regimen (i.e., the work-to-rest relationship); and (6) coach encouragement (i.e., the verbal stimulation of coaches during SSGs). However, other possible task constraints have also been researched during SSGs, namely the influences of age, skill level, tactical knowledge, physical status, or mental fatigue on players [9–11].

The effects of these conditions/constraints on players' psychobiological responses [2, 12, 13], tactical behaviours [14], and their effects at a multidimensional level [1, 15] have been summarized and systematically revised over the recent several years. However, there is a lack of systematization of the effects of SSGs on technical actions in male soccer players from different age categories. The systematization of such effects might help sports scientists and coaches to understand the main effects of different task conditions/constraints on technical actions and could provide useful information that allows coaches to optimize the adjustment of the game to the purpose. As such, the purpose of this study was to systematically review and organize the literature on soccer SSGs to identify the effects of different task conditions on the technical actions performed by male players of different ages.

Material and methods

Search strategy: databases and inclusion criteria

The present systematic review and the associated search followed the PRISMA (preferred reporting items for systematic reviews and meta-analyses) guidelines [16]. The electronic databases of Web of Science, PubMed, and SPORTDiscus were searched on October 12th, 2019 for relevant publications, with the use of the keywords 'football' OR 'soccer,' each associated with 'SSG*' OR 'drill based training' OR 'small sided and conditioned games' OR 'position games' OR 'small sided' 'small-sided games'.

The inclusion criteria for the articles were: (1) relevant data concerning technical actions; (2) participants included any age group or competitive level; (3) only men were included; (4) only studies conducted in soccer players; (5) only studies published in English; and (6) only full articles. The following exclusion criteria were applied: (1) studies in women; (2) studies conducted in physical education contexts; (3) non-English articles; (4) conference abstracts, letters to the editor, errata, narrative reviews, systematic reviews, meta-analyses, or invited commentaries; (5) studies that did not include relevant data for this study or aroused serious concerns about the methodology; and (6) studies without analysis of technical actions.

Two reviewers independently screened citations and abstracts to identify articles potentially meeting the inclusion criteria. For those cases, the full article was retrieved and independently screened by the 2 reviewers to determine whether it met the inclusion criteria. Disagreements between the independent reviewers in terms of inclusion criteria were resolved through discussion.

Quality of the studies and extraction of data

The quality of the studies was assessed by a risk-of-bias quality form of 16 items validated and adjusted for the specific context of SSG research [1, 17]. The items of analysis were [1]: purpose (item 1), relevance of background literature (item 2), appropriateness of the study design (item 3), sample included (items 4 and 5), informed consent procedure (item 6), outcome measures (items 7 and 8), method description (item 9), significance of results (item 10), analysis (item 11), practical importance (item 12), description of drop-outs (item 13), conclusions (item 14), practical implications (item 15), and limitations (item 16).

All the 16 quality criteria were scored on a binary scale (0/1), wherein 2 of those criteria (items 6 and 13) presented the option: 'If not applicable, assume NA'. Two independent reviewers screened and rated the included full articles and the scores were tested by using the *k* agreement rate between reviewers. The result of *k* agreement was $k = 0.94$.

The sum of scores of all items was divided by the number of relevant scored items for the specific research design. On the basis of this procedure, the articles were classified as displaying [1]: (1) low methodological quality (≤ 50%); (2) good methodological quality (51–75%); and (3) excellent methodological quality (> 75%).

A data extraction sheet [18] was used in the present systematic review to define the inclusion requirements and then tested with 10 randomly selected studies (pilot test). One author extracted the data, and the other verified them. Disagreements were resolved in discussions between the authors.

Ethical approval

The conducted research is not related to either human or animal use.

Results

Search, selection, and inclusion of publications

The initial search identified 339 titles in the aforementioned databases. These data were then exported to reference manager software (EndNote™ X8, Clarivate Analytics, Philadelphia, USA). Any duplicates (199 references) were eliminated either automatically or manually. The remaining 140 articles were then screened for relevance on the basis of their title and abstract, which resulted in 41 studies eliminated from the database. The full text of the remaining 99 articles was examined in more detail; 62 were rejected because they did not meet the inclusion criteria. At the end of the screening procedure, 37 articles were selected for in-depth reading and analysis (Figure 1). The main factors for exclusion were that studies only tested tactical behaviour/collective organization (*n* = 28) and only included analysis of internal and external load (*n* = 16). Other studies were excluded because they referred to formal games (*n* = 4); constituted conference abstracts (*n* = 4), narrative reviews (*n* = 2), or qualitative analyses (*n* = 2); were not written in English (*n* = 2), not related with SSGs (*n* = 2), related with other sports (*n* = 1), or related with fitness only (*n* = 1). Among the included studies, 38% were published in the recent 3 years (i.e., 2017, 2018, and 2019).

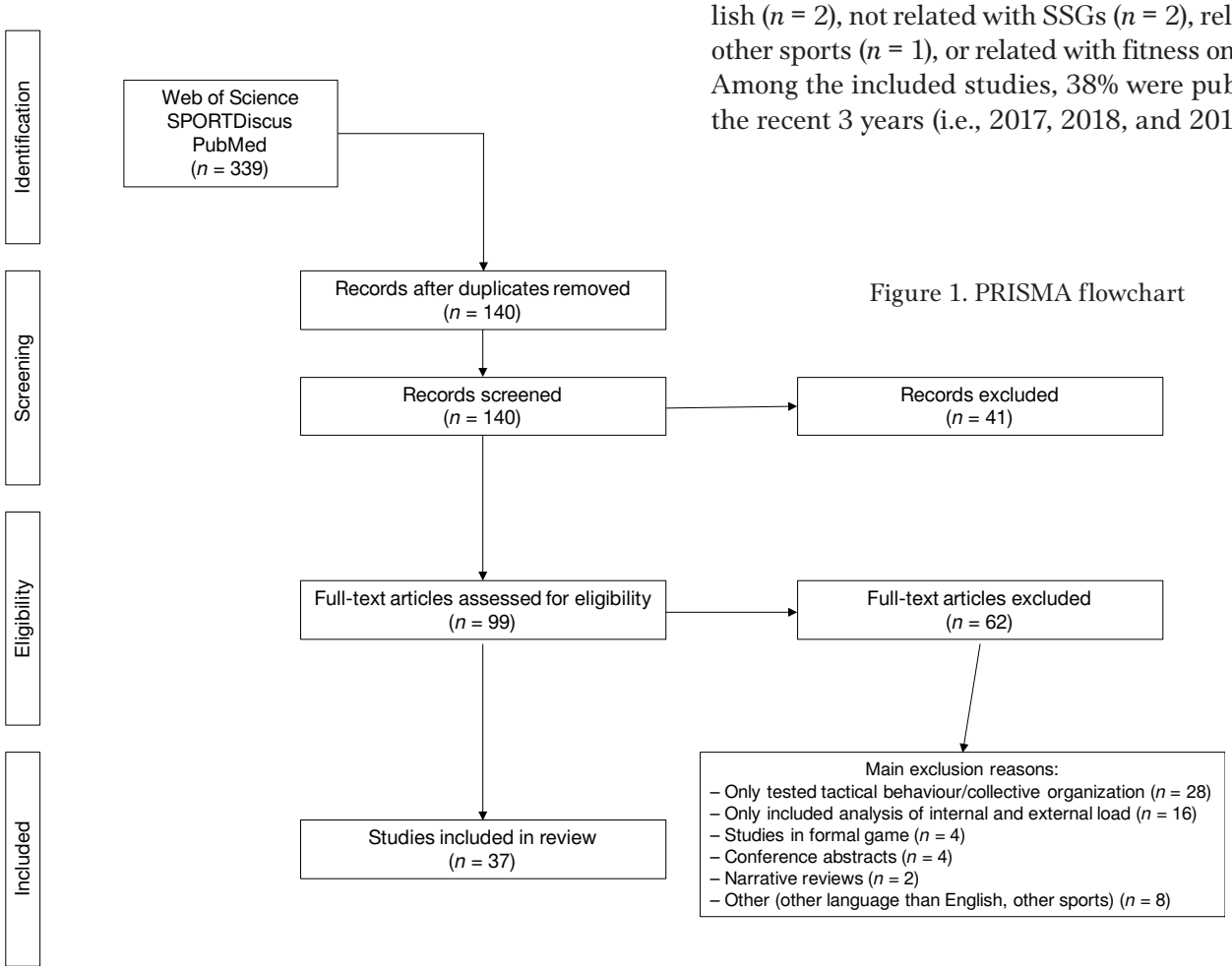

Figure 1. PRISMA flowchart

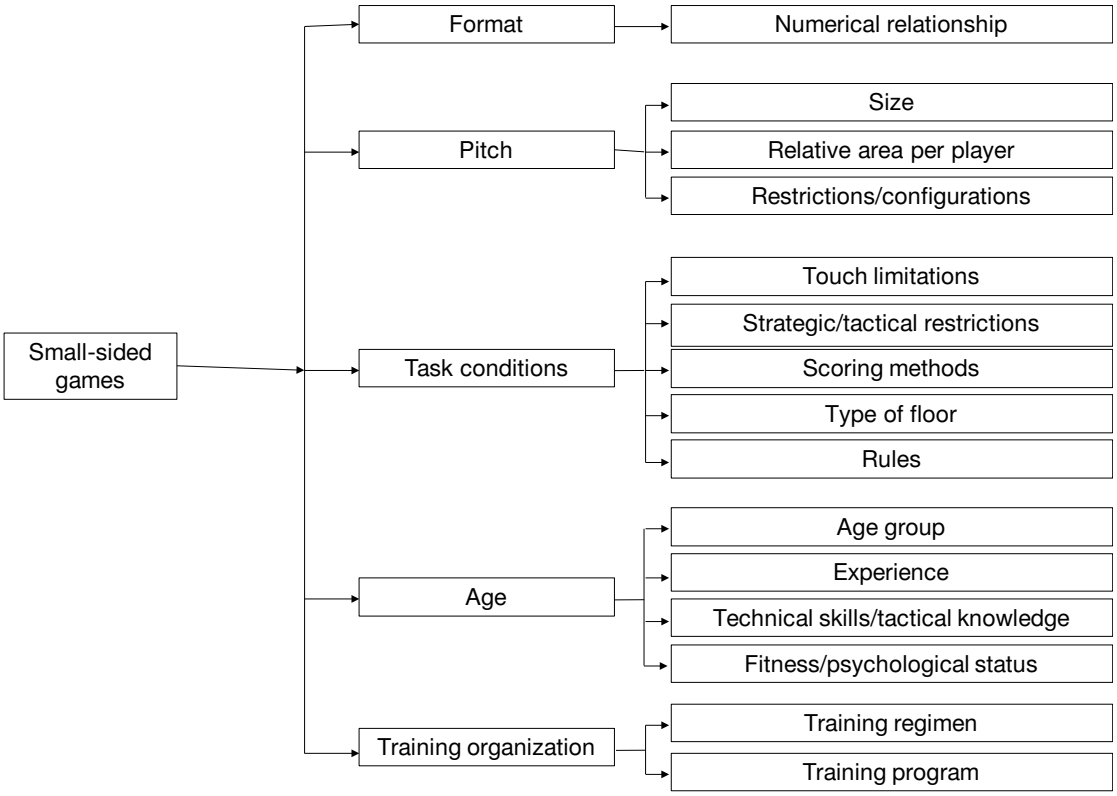

Figure 2. Main small-sided game topics

Quality assessment

None of the articles presented a 100% score, although the minimum score was 86.7%. The main potential deficiencies of the 37 included papers were mainly related to failing to clearly acknowledge the study limitations and the justification for the sample size used.

Data organization

The effects of SSGs on technical actions were fundamentally related with manipulations of task conditions. On the basis of the in-depth reading and careful analysis, it was decided that the most appropriate way to present the results would be to organize the task condition in the following topics: (1) effects of different formats (n = 10); (2) effects of different pitch sizes, relative area per player, pitch restrictions and configurations (n = 9); (3) effects of different task conditions (n = 9); (4) effects of age group, experience, and technical skill (n = 4); and (5) effects of training regimens or structured training programs (n = 5). The specific organization in topics can be found in Figure 2.

The 2 independent reviewers (FMC and HS) classified the articles depending on the main purpose of research and distributed in the research topics. Disagreements were resolved through discussion until a consensus was found.

Effects of format

Five studies [19–23] tested 1 vs. 1 to 3 vs. 3 SSGs, and 3 studies [24–26] included comparisons with games that followed the formal format. Two studies [27, 28] assessed the effects of unbalanced numerical relationships by using floaters (i.e., neutral players who provided support to the team via momentary possession of the ball) (Table 1).

Effects of pitch size, relative area per player, pitch restrictions and configurations

Seven of the 9 included studies [29–35] investigated the effects of different pitch dimensions and relative areas per player on technical actions made during different formats of play. One study [36] tested the manipulation of the width-to-length ratio. One paper [37] focused on the effects of different external markings on the pitch. One of the included articles [34] evaluated the effects of different pitch dimensions on actions performed by goalkeepers (Table 2).

Table 1. Effects of different formats and numerical relationships on technical actions

Reference	Sample	Aim	SSGs format	Pitch dimensions	Area per player*	Training regimen	Rules	Analysed variables	Main evidence	Quality score
[19]	10 soccer players, 13.5 ± 0.5 yo	Analyse the impact of changes in format on technical actions	3 vs. 3 4 vs. 4 5 vs. 5	30 × 30 m 30 × 30 m 30 × 30 m	150 m^2 112.5 m^2 90 m^2	3 × 4'/3' active recovery	No goalkeepers; small goals; goals only considered when all the teammates were in the opponent's half of the pitch	Involvements with the ball Passes Target passes Crosses Shot on goal Tackles Headers	No meaningful changes in the frequency of technical actions were found between formats. Variability of technical actions varied between 6.8 and 19.3% (CV). Maturation had no influence on technical actions	93.3
[20]	15 soccer players, 26.3 ± 4.9 yo (professional players)	Analyse the impact of changes in format on technical actions	3 vs. 3 + GK 9 vs. 9 + GK	30 × 25 m 60 × 50 m	125 m^2 167 m^2	3 × 5'/4' passive recovery	Normal match rules	Block Dribble Header Interception Pass Receive Shot Turn Tackle Total ball contacts per game Ball contacts per individual	Meaningfully greater values of block, header, interception, pass, receive, turn, and total ball contacts per game were found in the 9 vs. 9 + GK. Meaningfully greater number of ball contacts per player, dribbles, shots, and tackles were found in the 3 vs. 3 + GK	86.7
[24]	40 soccer players, 25.3 ± 2.4 yo (international players)	Analyse the impact of changes in format on technical actions	4 vs. 4 Match-play	30 × 20 m 100 × 60 m	75 m^2 300 m^2	4 × 4'/3' passive recovery; 90' for the match play	There were 3 conditions on the SSG (1-ball touch limitation, 2-ball touch limitation, and free play). The game was played aiming to keep the ball possession using 4 external support players	Number of duels Percentage of successful passes Total number of balls lost Total number of ball possessions	Greater number of duels and lost balls and a lower percentage of successful passes and total number of ball possessions were observed in the 4 vs. 4 compared with match-play. Forwards had similar results between SSG and match play	86.7
[21]	20 soccer players, 27 ± 2 yo (international players)	Analyse the impact of changes in format and periods on technical actions	2 vs. 2 3 vs. 3 4 vs. 4	20 × 15 m 25 × 18 m 30 × 20 m	75 m^2 75 m^2 75 m^2	4 × 2'/3' 4 × 3'/3' 4 × 4'/3'	Two-ball touch limitation. The games were played aiming to keep the ball possession using 4 external support players	Total number of duels Successful passes (%) Total number of lost balls Total number of ball possessions	Significantly greater number of duels and percentage of successful passes were found in the first and second periods (bouts) compared with the last period (bout). Frequency of balls lost increased progressively from period 1 to period 4. Ball possessions were similar across the periods	86.7
[22]	10 soccer players, under-10 (age not described)	Analyse the impact of changes in format and periods on technical actions	3 vs. 3 + GK 5 vs. 5 + GK	36 × 27 m 60 × 45 m	162 m^2 270 m^2	1 × 8'	Not mentioned	Shoot at goal Keep possession of the ball Earn a foul, win a corner or throw-in Commit a foul, give away a corner or throw-in Loss of ball possession Regain ball possession Ball possession of the opponent Take a shot at own goal	Shoots at goal and take a shoot at own goal were significantly greater at the 3 vs. 3	80.0
[25]	10 soccer players, 27.6 ± 4.1 yo (professional)	Analyse the impact of changes in format and periods on technical actions	4 vs. 4 5 vs. 5 6 vs. 6 7 vs. 7 8 vs. 8 9 vs. 9 10 vs. 10 11 vs. 11	30 × 25 m 46 × 40 m 50 × 44 m 54 × 45 m 60 × 50 m 70 × 56 m 80 × 70 m 100 × 74 m	94 m^2 184 m^2 183 m^2 174 m^2 188 m^2 218 m^2 280 m^2 336 m^2	3 × 5'/3' rest	Normal match rules	Pass Receive Turn Dribble Header Tackle Block Interception Shot	The more players on the pitch, the fewer total passes and receives made. Significantly greater number of dribbles and shots were found in the smaller formats. Greater number of headings and interceptions were found the in the larger games	86.7

[23]	18 soccer players, under-11 (age not described)	Analyse the impact of changes in format on technical actions	3 vs. 3 + GK 6 vs. 6 + GK	30 × 19.5 m 60 × 39 m	98 m^2 195 m^2	1 × 8'	Not mentioned	Shoot at goal Keep possession of the ball Earn a foul, win a corner or throw-in Commit a foul, give away a corner or throw-in Loss of ball possession Regain ball possession Ball possession of the opponent Take a shot at own goal	Significantly greater values of shoots at goal were found in 3 vs. 3 format. Significantly greater values of keep possession of the ball, loss of ball possession, and ball possession of the opponent were found in the 6 vs. 6	80.0
[27]	44 soccer players, 23.1 ± 0.7 yo (amateur; *n* = 22), 25.6 ± 4.9 yo (professional; *n* = 22)	Analyse the impact of changes in format on technical actions	4 vs. 3 + GK 4 vs. 5 + GK 4 vs. 7 + GK	40 × 30 m	171 m^2 133 m^2 109 m^2	1 × 3'	Regular rules. Scoreboard return to 0 every time when a difference of 2 goals was achieved	Run to the ball Wait Control Pass Shoot Protect Drive Feint Dribble Intercept Deflect Clear Anticipate Support Unmark Press Delay Dissuade Balance Withdraw	Greater number of opponents led to increases in the frequency of defensive patterns (namely, controlling) and a decrease in the number of waiting. Increasing the number of opponents decreased the number of passes and driving by players with possession	86.7
[28]	22 soccer players, 17.2 ± 0.9 yo	Analyse the impact of floaters (internal and external) on technical actions	4 vs. 4 4 vs. 4 + 2 4 vs. 4 + 2 + 2 4 vs. 4 + GK 4 vs. 4 + 2 + GK 4 vs. 4 + 2 + 2 + GK	40 × 30 m	150 m^2 120 m^2 #120 m^2 150 m^2 120 m^2 #120 m^2	4 × 4'/2'	SSGs with 2 + 2 neutral players representing the use of both internal and external supporters. Offside rule not included	Pass Dribbling Collective success Game pause	4 vs. 4 formats (with and without GK) increased the number of dribbling in comparison with formats with neutral players. 4 vs. 4 formats without GK (with and without neutral players) meaningfully increased the collective success compared with formats with GK	86.7
[26]	27 soccer players, under-12 (age not described)	Analyse the impact of changes in format on technical actions	8 vs. 8 11 vs. 11	62 × 51 m 80 × 54 m	198 m^2 196 m^2	1 × 25'	No shoot directly at kick-off; could not pass the ball over the halfway line at goal kick; GK could not kick over the half-way	Ball touches Passes Passes in attacking area Passing in attacking 1/3 area Passes in defence area One-touch pass Forward passes Shot, mid-, and long-distance passes Shots Goals Duels Cutbacks Crosses Dribbles	The smaller format meaningfully increased the frequencies of ball touches, all passes, passes in different areas and the success of those passes, short and mid-distance passes, goal shots, shots in penalty area, and successful dribbles	86.7

yo – years old, CV – coefficient of variation, GK – goalkeeper, SGG – small-sided game
* excluding GK, # the relative area per player excluded the 2 external neutral players

Table 2. Effects of manipulation of pitch size, relative area per player, pitch restrictions and configurations on technical actions

Reference	Sample	Aim	SSGs format	Pitch dimensions	Area per player	Training regimen	Rules	Analysed variables	Main evidence	Quality score
[29]	8 soccer players, 18 ± 1 yo	Analyse the impact of changes in pitch size on technical actions	5 vs. 5 + GK	30 × 20 m 40 × 30 m 50 × 40 m	60 m^2 120 m^2 200 m^2	4 × 4'/2' active recovery	No specific rules	Pass Received Turn Dribble Header Tackle Interception Shot Target pass	Significant increases of tackles and shots occurred on smaller pitch dimensions. Pitch size does not seem to significantly change the technical actions	86.7
[30]	10 soccer players, 15.5 ± 0.5 yo	Analyse the impact of changes in pitch size on technical actions	5 vs. 5 + GK	32 × 23 m 50 × 35 m 62 × 44 m	74 m^2 175 m^2 273 m^2	1 × 8'	No offside rule	Tackle Interception Control Control and dribble Control, dribble, and pass Control and pass Control and shoot Header First-touch pass Clearance Putting ball in play	Smaller pitch dimension presented significant increases of clearance and putting ball in play compared with the remaining dimensions. Smaller format had significant increases of interception, control, and dribble compared with the larger pitch. The effective playing time was higher in the largest pitch	86.7
[31]	10 soccer players, 31.7 ± 7.6 yo (recreational players)	Analyse the impact of different pitch sizes and formats on technical actions	5 vs. 5 + GK 5 vs. 5 + GK 7 vs. 7 + GK 7 vs. 7 + GK	44 × 23 m 57 × 30 m 44 × 23 m 57 × 30 m	101 and 171 m^2 for 5 vs. 5 72 and 122 m^2 for 7 vs. 7	1 × 40'	There were no throw-ins The matches occurred in outdoor and sand carpet	Ball possessions Dribbling Successful pass Unsuccessful pass Tackle Shot	Ball possessions were significantly greater on the smaller pitch. Unsuccessful passes were also significantly greater on the smaller pitch	86.7
[32]	32 soccer players, 12.0 ± 0.4 yo	Analyse the impact of different pitch dimensions on technical actions	7 vs. 7 + GK 7 vs. 7 + GK 11 vs. 11 (regular)	68 × 47 m 75 × 47 m 75 × 47 m	228 m^2 252 m^2 176 m^2	1 × 30'	Regular rules	Blocked balls Back passes Side passes Forward passes Short-distance passes Mid-distance passes Long-distance passes Continuous passes All passes	The 7 vs. 7 + GK format played in the bigger pitch dimension significantly increased the number of forward passes and all passes	93.3
[33]	33 soccer players, 10.0 ± 0.5 yo (n = 17), 13.2 ± 0.3 yo (n = 16)	Analyse the impact of different relative space per player on technical actions	3 vs. 3 3 vs. 3 4 vs. 4 4 vs. 4 5 vs. 5 5 vs. 5	20 × 20 m 30 × 30 m 20 × 20 m 30 × 30 m 20 × 20 m 30 × 30 m	67 m^2 150 m^2 50 m^2 113 m^2 40 m^2 90 m^2	3 × 4'/3' active recovery	No GK. Goals were only valid when all the team were within the opponent's half	Involvements with the ball Crosses Headers Tackles Shots on goal Dribbles Passes Target passes	The older group performed more dribbles, crosses, and tackles in the case of smaller relative space. In greater relative space, greater values of involvements with the ball were found. A scattered distribution of technical actions among different relative spaces was observed among younger players	86.7

[34]	13 soccer players, 16.6 ± 0.9 yo	Analyse the impact of different pitch dimensions on technical actions made by GK	5 vs. 5 + GK	32 × 23 m 50 × 35 m 62 × 44 m	74 m^2 175 m^2 273 m^2	3 × 8'/5'	There were no corners	Save Parry Clear-out Deflection Open palm technique Fly Screen Control with the foot Clear-out by the defence 1-on-1 Goal kick Direct and indirect free kick Pass by hand and foot	The larger pitch increased the frequencies of duels and blocks. The smaller pitch increased the number of passes performed with both hand and foot	86.7
[35]	148 soccer players, 12.5 ± 0.5 yo (*n* = 36), 14.4 ± 0.5 yo (*n* = 43), 16.6 ± 3.2 yo (*n* = 28), 17.9 ± 1.0 yo (*n* = 43)	Analyse the impact of different pitch dimensions on technical actions	4 vs. 4 + GK 4 vs. 4 + GK	40 × 30 m 68 × 47 m	120 m^2 320 m^2	1 × 4'	Offside rule was not applied in the smaller pitch dimension	Transitions Ball possessions Set pieces Goals/shots	The bigger pitch led to longer periods of ball possession and less transitions	86.7
[36]	20 soccer players, 14.1 ± 0.5 yo	Analyse the effects of different pitch formats (manipulating the length and width) on technical actions	4 vs. 4 + GK	40 × 30 m 30 × 40 m	150 m^2 150 m^2	3 × 6'/3' rest	Offside was not applied	Passes Lost balls Dribbles Shoots Goals	The 30 × 40 m led to meaningful increases in the number of shots per player. The 40 × 30 m meaningfully increased the completed passes per player	86.7
[37]	10 soccer players, 13.7 ± 0.5 yo	Analyse the effects of different external markings of the pitch on technical actions	5 vs. 5 + GK	30 × 25 m	75 m^2	3 × 6'/3' rest	Three different external markings were used: (1) complete lines, (2) dashed lines, and (3) painted marker in the corners	Passes Dribbles Shots on target Goals	Compared with corners, the lines presented the number of offensive technical indicators. Lines revealed a lower number of passes	93.3

yo – years old, GK – goalkeeper, SGG – small-sided game

Table 3. Effects of different task conditions on technical actions

Reference	Sample	Aim	SSGs format	Pitch dimensions	Area per player	Training regimen	Rules	Analysed variables	Main evidence	Quality score
[39]	20 soccer players, 27.4 ± 1.5 yo (national team)	Analyse the impact of different ball-touch limitations (1 touch, 2 touches, and free play) on technical actions	4 vs. 4	30 × 20 m	75 m^2	4 × 4'/3' passive recovery	Keep the ball as long as possible for a given team using 4 support players outside of the pitch	Number of duels Percentage of successful passes Number of balls lost Total number of ball possessions	Free-play rule increased the number of duels in each bout and affected less the technical actions (successful passes and number of ball losses) from bout 1 to last compared with the 1- and 2-ball touch limitations. The 1-ball touch limitation increased the total number of ball possessions but significantly decreased the % of successful passes compared with the remaining conditions	86.7
[38]	20 soccer players, 27.4 ± 1.5 yo (national team)	Analyse the impact of different ball-touch limitations (1 touch, 2 touches, and free play) on technical actions	2 vs. 2 3 vs. 3 4 vs. 4	20 × 15 m 25 × 18 m 30 × 20 m	75 m^2 75 m^2 75 m^2	4 × 2'/2' passive recovery 4 × 3'/3' passive recovery 4 × 4'/4' passive recovery	Keep the ball as long as possible for a given team using 4 support players outside of the pitch	Number of duels Duels per minute of play Percentage of successful passes Number of balls lost Balls lost per minute of play Total number of ball possessions	The free-play condition contributed to the largest number of duels per minute in the 4 vs. 4; however, during the 2 vs. 2, the largest number occurred in the 2-touch condition. The 1-touch limitation led to the smallest % of successful passes and to the greatest number of balls lost per minute and total number of possessions	86.7
[43]	16 soccer players, 15.8 ± 0.5 yo	Analyse the effects of different task conditions (playing only offense, playing only defence, both) on technical actions	3 vs. 3 + GK 4 vs. 4 + GK	30 × 20 m 40 × 20 m	100 m^2 100 m^2	4 × 4'/2' active recovery	Not mentioned	Pass Receive Dribble Shot Tackle Interception	No meaningful differences in technical actions between formats or task conditions. There was interaction in passes; higher pass effectiveness in the 4 vs. 4 (free – both situations) compared with 3 vs. 3 (free – both situations)	86.7
[40]	10 soccer players, 26.4 ± 5.3 yo (amateurs)	Analyse the effects of 3 different scoring methods (line to cross, 2 small goals, and 1 central small goal) on technical actions	2 vs. 2 + 2 3 vs. 3 + 2 4 vs. 4 + 2	19 × 19 m 23 × 23 m 27 × 27 m	90 m^2 90 m^2 90 m^2	3 × 5'/3' rest	The 2 neutral players provided numerical advantage to the team with ball possession. In the line to cross condition, the point was earned every time that a player received the ball behind the line from his teammate	Conquered balls Received balls Lost balls and neutral balls Pass Successful shot on goal The technical actions were then converted into the following items: volume of play, attacks with ball, efficiency index, and performance score	Significantly greater efficiency index, performance score, and attacks with ball were found in line to cross condition. Comparisons between formats revealed significantly greater values of volume of play and efficiency index in the smaller format (2 vs. 2 + 2)	93.3
[41]	24 soccer players, 19.1 ± 1.2 yo	Analyse the effects of different scoring methods (small goals, GKs, floaters) on technical actions	7 vs. 7 + GK 7 vs. 7 7 vs. 7 + GK + 2 outside neutral players	40 × 25 m	71 m^2	1 × 6'	The 7 vs. 7 without GK used small goals. No offside rule	Percentage of total possession Offensive sequences (duration)	Formats using small goals and neutral players had greater possession duration compared with the format with only GK	93.3

[42]	8 soccer players, 12.1 ± 0.5 yo	Analyse the effects of different scoring methods (2-goal game, 4-goal game, 2-goal game with goal-posts, 4-goal game with 1 goal positioned infield each corner) on technical actions	4 vs. 4	45.72 × 36.58 m	209 m^2	2 × 5'/3'	Scoring methods were: (1) 2-goal game, (2) 4-goal game, (3) 2-goal game with goal-posts, (4) 4-goal game with 1 goal positioned infield each corner. There were no throw-ins during the games	Pass forwards Pass sideways Pass backwards Successful pass Unsuccessful pass Penetrating pass Turning Dribbling Shot Goal Overlap One-two 1 vs. 1 (duels)	Higher frequencies of successful pass forwards and backwards and penetrating pass occurred in the 2-goal game condition. Successful pass sideways occurred more often in the 4-goal game. More turnings were found in the 4-goal condition. Shots and goals were more frequent in the condition of 4-goal game with 1 goal positioned infield each corner	93.3
[45]	8 soccer players, 20.1 ± 1.0 yo (amateurs)	Analyse the effects of the type of floor (sand, artificial turf) on technical actions	4 vs. 4 + GK	37 × 28 m	130 m^2	3 × 6'/3' rest	No offside rule	Involvements with the ball Passes or crosses Headers Chest trap Tackles Dribbling Shots Goals	More succeeded actions were achieved in artificial turf in comparison with sand. Actions requiring lifting the ball were higher on sand than on artificial sand	86.7
[44]	16 soccer players, 23.9 ± 5.4 yo (semi-professional)	Analyse the effects of coach's instruction on technical actions	7 vs. 7 + GK	62 × 50 m	221 m^2	1 × 5'	The teams received no instructions and instructions about defensive and offensive strategy. Regular rules were followed	Ball recoveries Number of passes per ball possession	Defensive instruction increased recovered balls and decreased the space occupied. Offensive instructions resulted in greater number of passes and increased the space occupied compared with control group (no instructions)	93.3
[46]	20 soccer players, 13.5 ± 1.2 yo (n = 10), 16.3 ± 0.5 yo (n = 10)	Analyse the effects of changing rules and configurations on technical actions	3 vs. 3 + GK 4 vs. 4 + GK	36 × 27 m 47.72 × 29.54 m	162 m^2 176 m^2	1 × 10'	Three representative SSGs, 3 maintaining ball possessions, and 3 progressions to target games were implemented	Ball possessions Players involved Ball touches Passes Shots	Smaller SSGs configurations increased the difficulties of keeping ball possession in younger players. The 3 vs. 3 format promoted better offensive efficacy in progression games. The condition of maintaining ball possession contributed to longer passing sequences and more players involved	86.7

yo – years old, GK – goalkeeper, SGG – small-sided game

Table 4. Effects of different age groups, experience, and technical level

Reference	Sample	Aim	SSGs format	Pitch dimensions	Area per player	Training regimen	Rules	Analysed variables	Main evidence	Quality score
[47]	28 soccer players, 12.8 ± 0.6 yo (*n* = 14 non-experienced), 12.9 ± 0.6 yo (*n* = 14 experienced)	Analyse the interaction between experience of players and play format on the technical actions	3 vs. 3 + GK 6 vs. 6 + GK	46 × 31 m 62 × 40.4 m	238 m^2 209 m^2	2 × 5'/1' rest	Offside rule was not applied	Duration of ball possession Players involved Ball touches Passes Players involved/ duration Ball touches/duration Passes/duration Ball touches/players involved Passes/players involved Passes/ball touches Shots Goal/shots Offensive sequences	Experienced players made significantly longer offensive sequences, with a great number of players involved that also executed more touches on the ball and more passing actions. Non-experienced players tended to build attacks based on individual actions; experienced players opted for ball possession style. Finalization was not different between experienced and non-experienced players in any format	86.7
[48]	48 soccer players, 13.1 ± 1.5 yo (*n* = 24), 16.9 ± 0.1 yo (*n* = 24)	Analyse the effects of age and tactical skills on technical actions	3 vs. 3 + 3 + GK 4 vs. 4 + GK	47.72 × 29.54 m 47.72 × 29.54 m	157 m^2 176 m^2	1 × 10'	Offside rule was not applied	Ball possession Players involved Ball touches Passes Shots	Highly skilled players had greater offensive dynamics and efficacy	86.7
[11]	27 soccer players, 17.4 ± 0.9 yo	Analyse the contributions of physical performance and technical skills on technical level during SSGs	5 vs. 5	30 × 25 m	75 m^2	4 × 5'/3'	No GK. Small goals were used	Players were evaluated by a game technical scoring chart in the following elements: First touch Awareness and overall control Control from the air Short passing Long passing Dribbling Turning Shooting Accuracy Two-footedness Attitude	The best determinant of the player's technical level during SSG was the dribbling skill performed with a pass. Technical performance was not meaningfully associated with physical performance	93.3
[9]	20 soccer players, 17.8 ± 1.0 yo	Analyse the impact of mental fatigue on technical performance	5 vs. 5	30 × 20 m	60 m^2	2 × 7'/1'	No GK. The goal was to keep the ball as long as possible	Passes Tackles Control errors Possessions Involvements Possession time	Mental fatigue negatively affected technical performance. Tackle success, % possessions and % involvements meaningfully decreased mental fatigue conditions. Control errors meaningfully increased under mental fatigue	86.7

yo – years old, GK – goalkeeper, SGG – small-sided game

Table 5. Effects of training regimens or structured training programs on technical actions and technical performance

Reference	Sample	Aim	Training program/ format	Pitch dimensions	Area per player	Training regimen	Rules	Analysed variables	Main evidence	Quality score
[52]	20 soccer players, 15.1 ± 0.7 yo (n = 11), 15.0 ± 0.5 yo (n = 9)	Analyse the effects of running-based high-intensity interval training and SSGs-based training on technical skills	Running-based group: 2 times/ week for 8 weeks SSGs group: 3 vs. 3 or 3 vs. 3 + neutral player 2 times/week for 8 weeks	SSGs: 30 × 18 m	SSGs: 90 m^2 and 77 m^2	5 × 4'/3'	Not mentioned	Technical skills assessed by a battery of tests of the German Soccer Federation including juggling, dribbling, heading, passing the ball into specified areas, shooting into specified sectors of the goal from the kick point, rotation pass from the corner of penalty area, and passing the ball against the bench	Both groups improved between pre- and post-training program. No meaningful differences between groups were found	93.8
[49]	12 soccer players, 15.4 ± 0.5 yo	Analyse the effects of different recovery durations between bouts on technical actions	3 vs. 3	30 × 18 m	90 m^2	4 × 4'/1' 4 × 4'/2' 4 × 4'/3' 4 × 4'/4'	Keep ball possession as long as possible. No goals	Touches of the ball per possession Total passes Successful passes Tackles Passes received	Significantly greater values of total passes and successful passes were found in the longer period of recovery (4'). Significantly more tackles and passes received occurred in the 3' recovery period	86.7
[50]	12 soccer players, 15.8 ± 0.6 yo	Analyse the effects of different work-to-rest ratios on technical actions	6 vs. 6 + GK	50 × 32 m	133 m^2	1 × 8' 2 × 4'/1' 4 × 2'/1'	No offside rule	Passes Successful passes Unsuccessful passes Shots Shots on target Goals Individual possessions Regains	Significantly fewer goals were scored in the continuous regimen. No significant differences were found in the remaining technical actions	86.7
[51]	18 soccer players, 21.8 ± 4.8 yo (amateurs)	Analyse the effects of running-based interval training and SSGs-based training on technical skills	6-week training program (2 times/week) Running-based group SSG-based program: 5 vs. 5 6 vs. 6	42 × 30 m (5 vs. 5) 48 × 36 m (6 vs. 6)	126 m^2 144 m^2	Running-based: 5 × 6'/3' at lactate threshold SSGs: 5 × 6'/3'	Not mentioned	Technical skills assessed by Loughborough Soccer Passing Test and offensive and defensive skills measured at match: Pass Dribble Ball control Tackle Interception Aerial duels	SSGs-based group meaningfully decreased the time to complete the Loughborough Soccer Passing Test and also increased the number of defensive and offensive skills (pre-post analysis). No meaningful changes were found in the running-based group	86.7
[53]	19 soccer players, 10.6 ± 0.6 yo (average-skill group; n = 10), 10.7 ± 0.5 yo (low-skill group; n = 9)	Analyse the effects of 2 SSG-based teaching programs on decision-making and technical actions	Two periods of 14 sessions of intervention Intervention 1: modified games in numerical superiority Intervention 2: modified games in numerical equality	Numerical superiority: 3 vs. 2 4 vs. 3 5 vs. 4 4 vs. 4 + 1 Numerical equality: 3 vs. 3 4 vs. 4 5 vs. 5	30 × 15 m (3 vs. 2) 35 × 20 m (4 vs. 3) 40 × 25 m (5 vs. 4) Not mentioned to numerical equality	1 × 15' each	Formats had different task conditions based on the principles of representation, complexity, and exaggeration	Decision-making and execution of passes	Numerical superiority led to meaningful increases in the decision-making and pass execution. Low-skill group also improved the pass execution from the first to the second interventions	87.5

yo – years old, GK – goalkeeper, SGG – small-sided game

Effects of different task conditions

Two studies [38, 39] tested the effects of different limitations on consecutive ball touches. Three papers [40–42] compared the effects of different scoring methods. Two studies [43, 44] compared the effects of strategic/tactical instructions or constraints. One study [45] assessed the effects of different pitch materials on technical actions performed. One article [46] referred to the effects of different rules (Table 3).

Effects of age group, experience, and technical skill

One study [47] tested the effects of different age groups and expertise levels on technical actions performed during SSGs. One study [48] investigated the effects of different tactical skills. Another paper [11] focused on the effects of different physical performance levels and technical skills on technical actions. Finally, 1 study [9] assessed the impact of players' mental fatigue (Table 4).

Effects of training regimens or structured training programs

Two studies [49, 50] tested the effects of different recovery periods and work-to-rest ratios on technical actions performed by players. Three studies [51–53] evaluated the effects of SSG-based training programs on technical actions and technical skills of players (Table 5).

Discussion

This systematic review is intended to describe noteworthy evidence about different task constraints on technical actions performed during SSGs. Most of the studies reveal that different conditions influence the frequencies and success of technical actions. The discussion aims to present the main evidence, which is organized in the topics studied.

Effects of format

Changing the number of players involved in SSGs is a constraint often used by coaches and constitutes one of the main topics researched [1, 2]. Typically, SSG formats can be classified as extreme (1 vs. 1), small (2 vs. 2 to 4 vs. 4), medium (5 vs. 5 to 8 vs. 8) and large (9 vs. 9 to 11 vs. 11) sided games [25]. The format of play may be balanced (i.e., both teams have the same number of players) or unbalanced (i.e., additional neutral players, i.e. floaters, provide a temporary advantage to the team with possession of the ball). The studies that tested and compared different balanced formats provide different evidence, as the comparisons between formats were different (Table 1). When small-to-medium-sided games (e.g., 2 vs. 2 to 4 vs. 4) were compared with medium-to-large-sided games (i.e., 5 vs. 5 to 11 vs. 11), it was consistently found that a meaningfully greater number of passes, ball contacts, involvements, dribbles, and shots occurred in the small-to-medium games [20, 24–26].

Such evidence was found in very young players (under-12), as well as professional players. An exception to this tendency occurred in a study that compared a small format (3 vs. 3) with a medium format (6 vs. 6) in under-11 players [23]. However, in that study, the relative area per player was not maintained between formats – the 6 vs. 6 format had almost double the relative area per player (195 m^2) that the 3 vs. 3 format had (98 m^2). Naturally, a greater amount of relative space could provide more time and space for players to execute passes and other actions. Nevertheless, it is expectable that players will execute more individual actions in smaller formats than in larger formats, specifically considering that players will have fewer teammates to rely on and that the need to be active and participate in all moments of the match will be higher.

Comparisons among different small formats were also conducted [19, 21, 22]. In this specific case, the evidence is not so clear as it is when small formats are compared with large ones. In a study that compared 3 vs. 3, 4 vs. 4, and 5 vs. 5 formats in under-14 players, no significant changes in terms of technical actions were observed. However, the comparisons could be influenced by the relative pitch area per player [19].

An interesting finding is related to the variability associated with technical actions across games (6.8–19.3% coefficient of variation) [19]. This is one of the concerns related to SSGs in youth, considering that recent studies have also revealed similarly considerable inter- and intra-session variability among youth players [5, 54]. Also, in studies conducted in under-10 players [22] and professional players [21], small SSGs were associated with meaningful changes in determinant actions, such as passes, receptions, and possessions.

Only 2 studies [27, 28] included in this systematic review tested the effects of unbalanced formats

of play. A study conducted among amateur and professional players compared differences that were caused by an addition or subtraction of 1 floater (4 vs. 3 and 4 vs. 5) or 3 floaters (4 vs. 7). The results reveal that increasing the number of opponents led to a decrease in the number of passes and drives by players with possession [27]. Another study that tested the influence of floaters (positioned inside and outside of the pitch), conducted in professional players [28], reported that floaters contributed to a decrease in the number of dribbles within the pitch, though adding to collective success.

In short, the evidence about different formats reveals that using small formats (2 vs. 2 to 4 vs. 4) significantly increases the number of determinant technical actions (e.g., passes, receptions, involvements, and dribbles). However, comparisons within categories (e.g., small-, medium-, and large-sided games) are not so clear in terms of meaningful effects on technical actions. Moreover, the use of unbalanced formats contributes to meaningful changes in the technical actions performed. Specifically, the use of floaters results in more successful actions and a higher frequency of defensive actions, although aggressive actions (i.e., dribbles and duels) are reduced.

Effects of pitch size, relative area per player, pitch restrictions and configurations

Different pitch sizes were used for the same format of play to explore the effects of having more or less space and time to make decisions and execute actions depending on the demands of the game. In the present systematic review, 9 studies were included that tested the effects of different pitch sizes (and amounts of relative area per player) or pitch restrictions/configurations. Of these, 5 studies [29–31, 33, 34] investigated the effects of different pitch sizes in the 5 vs. 5 + goalkeeper (GK) format. Among the different amounts of relative area per player (which is calculated as the pitch size divided by the number of players involved, excluding goalkeepers) proposed for the 5 vs. 5 format, the smallest was 40 m^2 (20 × 20 m) [33], and the largest was 273 m^2 (62 × 44 m) [30, 34].

The findings in 5 vs. 5 SSGs were consistent in that they revealed that smaller pitches (40–101 m^2) meaningfully contributed to more tackles [29, 33], dribbles [30, 33], passes/ball possessions [31, 34], and interceptions [30]. These observations suggest that smaller pitches lead to smaller distances between players and, consequently, greater pressure from opponents, thus increasing the need to be involved with and to recruit teammates to complete actions and providing more and greater opportunities for players to take defensive actions. Interestingly, in a study conducted among 148 under-12 soccer players, longer ball possessions and fewer transitions occurred on a large pitch (320 m^2) than on a small pitch (120 m^2) for a 4 vs. 4 + GK format [35].

Changes in the width and length of the pitch can also affect technical actions. A study performed in under-15 players tested the effects of 2 different pitch configurations (40 × 30 m and 30 × 40 m) with the same relative area per player [36]. The findings reveal that more shots were recorded during games played on the 30-m long field and that more passes occurred in games played on the 40-m long field [36]. These observations suggest that short fields are associated with more shots, considering the reduced distance to the goal, while longer fields increase the need to pass the ball forward before a successful shot can be taken.

The way coaches mark the pitch can also affect the technical actions performed; the hypothesis was tested in the 5 vs. 5 + GK format on a 30 × 25 m pitch (75 m^2 per player) [37]. Three different external markings were used (complete lines, dashed lines, and painted markers in the corners). The use of complete and dashed lines resulted in a meaningfully greater number of offensive technical indicators than the use of markers in the corners, although fewer passes were made when complete and dashed lines were used [37].

To summarize the evidence, a small relative area per player (< 100 m^2) could significantly increase instances of most of the technical actions made by players. However, if the objective of the game is to increase ball possession, very large pitches (> 300 m^2) are recommended. Moreover, the length-to-width ratio should be considered. Implementing SSGs on relatively short fields could increase the exploration of attacking finalization (shots and goals), while using longer fields may lead to more passes and longer ball possession times. Finally, it is recommended that markers at the corners of the pitch are used when the exercise is designed to increase the number of passes. Meanwhile, lines are helpful when the goal of training is to increase other attacking actions.

Effects of different task conditions

Task conditions using modified rules are very common in practical scenarios and in SSG research [1, 2]. The studies included in the present systematic re-

view examined limitations in terms of the number of consecutive touches of the ball permitted [38, 39], different ways of scoring [40–42], strategic/tactical instructions or constraints [43, 44], different pitch materials [45], and different rules [46] and their effects on technical actions.

The effects of limiting the permitted number of consecutive touches of the ball were tested in 2 vs. 2, 3 vs. 3 [39], and 4 vs. 4 formats [38]. Comparisons between 1- and 2-touch limitations and free play in a 4 vs. 4 format in professional players revealed that free play increased the number of duels in each bout and decreased the number of technical actions (successful passes and ball losses) [39]. However, in the same study, the 1-touch limitation significantly increased the total number of ball possessions, though the percentage of successful passes decreased significantly [39]. In a comparison of the same ball-touch limitations in different formats (2 vs. 2, 3 vs. 3, and 4 vs. 4) among professional players, the free-play condition led to the largest number of duels per minute in the 4 vs. 4 format. However, for the 2 vs. 2 format, the largest number of duels occurred under the 2-touch condition [38]. Additionally, the 1-touch limitation significantly decreased the number of successful passes and significantly increased the number of balls lost and the number of possessions.

Both studies [38, 39] tested the effects of ball-touch limitations in professional players. The extent of the decreases in successful actions might be greater for amateur or youth players, and this should be carefully considered. By considering the few studies in professionals, it is possible to identify that free play provides more opportunities than other forms of play to increase the number of duels, while using a 1-touch limitation significantly increases the number of possessions and passes while also contributing to a greater number of errors and balls lost.

Changes to the scoring method are also a common modification made to SSGs [1]. In a study conducted in amateur soccer players using 2 vs. 2 + 2 to 4 vs. 4 + 2 formats, researchers assessed the effects of different scoring methods, i.e., scoring by crossing the end line (no goal), using 2 small goals located at the end lines, and using a central small goal [40]. Comparisons between scoring methods revealed that attacking actions were performed with greater efficacy in the no-goal condition than in the other 2 conditions [40]. Also, in testing different scoring methods, a study conducted in under-20 players compared the effects of using small goals, goalkeepers, or floaters in different 7 vs. 7 formats [41]. In that study, it was found that using small goals and floaters significantly increased the duration of ball possession when compared with games with goalkeepers [41]. Finally, a study comparing 2-goal games, 4-goal games, 2-goal games with goalposts, and 4-goal games with one goal positioned infield at each corner in a 4 vs. 4 format among under-13 players [42] revealed that more successful forward, backward, and penetrating passes occurred in the 2-goal condition. However, successful sideways passes and turns took place more often in the 4-goal game [42].

In summary, it is possible that the use of goalkeepers reduces the success of passes and ball possession duration and that using no goals or small goals may increase the efficacy of technical actions and increase the frequencies of technical actions related to passes and ball possession. However, it is also important to consider that having goals on the sides will increase the number of sideways passes and turns, while using small goals only on the end lines will increase forward and penetrating passes.

Similarly to a study that tested the effects of coaches' verbal encouragements on physiological responses [55], one of the included studies investigated the effects of providing or not providing instructions for defensive and offensive strategies during a 7 vs. 7 + GK format among semi-professional players [44]. The results reveal that, when compared with the condition in which no instructions were provided, providing defensive instructions meaningfully increased the frequency of recovered balls and decreased the amount of space occupied, while providing offensive instructions meaningfully increased the number of passes and the amount of space occupied [44]. This suggests that receiving verbal instructions before SSGs can maximize the player's perception for specific behaviours. However, more research should be conducted to test such a hypothesis at different levels of competition and expertise.

Also included in this topic is a study that tested the influence of the type of pitch material (sand or artificial turf) on the number of technical actions made by amateur players during 4 vs. 4 SSGs [45]. The results imply that the use of artificial turf increased the success of technical actions when compared with sand. However, more lifting actions related to the ball were recorded when the SSGs were played on sand.

Effects of age group, experience, and technical skill

Possible factors influencing technical actions and success within SSGs are age, experience, technical

skills, and tactical knowledge [56, 57]. Although only a few studies were dedicated to examining the effects of such characteristics on technical actions, it was observed in under-13 players that the group of experienced players made longer offensive sequences, with more players executing more touches on the ball and more passes, than inexperienced players [47]. It was also observed in the same study that non-experienced players opted more often for building attacks based on individual actions, while using ball possession was preferred by experienced players [47].

Comparisons between players of different ages and technical skill levels in 3 vs. 3 + 3 + GK and 4 vs. 4 + GK formats revealed that players classified as having more technical skills achieved task goals more often and that those with greater tactical skills exhibited faster pass exchanges [48]. In the same study, it was also found that older players (under-17) presented more individual interventions and shots than younger players (under-15) [48]. Also, when testing the influence of the technical skills and fitness status of under-17 players in a 5 vs. 5 format, it was observed that the best determinant of the technical actions performed by the players was the dribbling skill carried out with a pass. It was also reported that fitness made small contributions to technical actions [11].

Despite the presence of only a few studies on this topic, it can be suggested that more skilled players tend to exhibit more involvement and success regarding technical actions made in small and medium SSGs. Moreover, older players tend to perform more technical actions than younger players.

Another study tested the effects of mental fatigue on players. Not directly referred to in the other articles included in this section, interestingly, mental fatigue negatively affected technical performance during 5 vs. 5 SSGs in under-18 players [9]. In fact, mental fatigue contributed to decreases in successful tackles, in ball possessions percentage, and in percentage of involvements; it also increased control errors [9]. This should be considered, namely in situations in which learning or developing specific technical actions are the primary focus of the drill.

Effects of training regimens or structured training programs

The use of SSGs in structured training programs has been studied mainly to describe physical and physiological adaptations [58, 59]. However, a few studies tested the effects of structured SSG-based programs on technical skills [51–53]. Two of the included studies [51, 52] on this topic (Table 5) compared the effects of SSG-based programs and running-based programs.

A study conducted in under-16 players over 8 weeks (2 sessions/week; 5 × 4 min per session) comparing high-intensity running-based training and interval training using 3 vs. 3 formats on small pitches (77–90 m^2) revealed that both groups improved in terms of technical skills after the program, without differences between groups [52]. In the other study, which compared high-intensity running-based training and interval SSGs (5 vs. 5 to 6 vs. 6) in senior amateur players, it was found that 6 weeks of training (2 sessions/week; 5 × 6 min per session) were enough for the SSG-based group to meaningfully decrease the time needed to complete the Loughborough Soccer Passing Test and to increase the number of defensive and offensive skills, which was not observed in players who completed the running-based program [51]. Although improvements were expected to be seen in the SSG-based group, neither of the 2 mentioned studies [51, 52] provided information about the type of training that players were exposed to before the study or about the trainability level of the players. Thus, these could be confounded factors.

A different approach was applied in a study conducted in under-11 players in which 2 SSG-based protocols were tested [53]. One of the protocols was based on numerical superiority formats (3 vs. 2 to 5 vs. 4), and the other was based on balanced formats (3 vs. 3 to 5 vs. 5). Both formats included 14 training sessions of 15 min [53]. The results suggest that greater improvements in decision-making and pass execution occurred in the numerical superiority SSG-based program. However, the study tested 2 groups (low- and average-skill levels), and the low-skill level players also improved in balanced formats, thus indicating that trainability played an important role in the acquisition and consolidation of processes [53].

The type of training regimen can also be manipulated to manage recovery within sessions and to avoid the effects of fatigue on technical actions performed by players [60]. With this assumption, 2 studies [49, 50] tested the effects of different SSG-related work and recovery periods on technical actions. The study conducted in under-16 players investigated the effects of different recovery periods (1, 2, 3, and 4 min) on technical actions performed in a 3 vs. 3 format played over 4 sets of 4 min [49]. The findings reveal that meaningfully greater values of total passes and successful passes were observed when a longer period of recovery was provided, although more tackles and received passes occurred with the 3-min period of recovery [49].

The duration of work repetitions (1 × 8 min vs. 2 × 4 min vs. 4 × 2 min) was tested by using 6 vs. 6 SSGs in a study conducted in under-16 players. The results show that significantly fewer goals were scored during the continuous regimen, although no other significant changes were found [50].

In summary, despite the existence of only a few studies on this issue, it can be suggested that recovery may affect the capacity of players to perform technical actions more often in small formats played with an interval regimen. Longer periods of recovery and a more balanced work-to-rest ratio might contribute to a high level of technical actions and success. On the other hand, the duration of repetitions may not be essential in large-sided games. Considering the training programs based on SSGs, it is expectable that low-skill-level players will benefit more from these programs than players at advanced levels. However, it is also expectable that SSG-based programs will provide more benefits than running-based programs when technical skills are considered exclusively.

Future studies

Despite evidence revealed in this systematic review, there is a lack of consistency in the results and, more important, in the methodologies. Future studies should largely increase the samples and, moreover, conduct repeated analysis with more frequency aiming to avoid the acute effects of learning curve to the game's dynamics and also to identify the variability of actions and behaviours during the period of analysis. Besides, the study of technical actions should be completed in the future by a tactical analysis aiming to check the dependent relationships between both of them. Finally, it is important to consider the intra-game effects of different skill levels in the same match and use some covariables as maturation, tactical knowledge, or others that may be closely related to the variations of technical actions.

Conclusions

The current systematic review allowed us to summarize the main effects of different task conditions on the technical actions performed by soccer players of different age groups and expertise levels. Some limitations exist regarding the topics considered and the consistency of the methodological approaches used in the examined studies. Nevertheless, it is possible to conclude that small formats (2 vs. 2 to 4 vs. 4) meaningfully increase the number of determinant technical actions performed (e.g., passes, receptions, involvements, and dribbles) when compared with medium and large formats (5 vs. 5 to 11 vs. 11). Moreover, smaller amounts of relative area per player (< 100 m^2) meaningfully increase most technical actions made by players. However, if the objective of the game is to increase ball possession, very large pitches (> 300 m^2) are recommended. The use of free play raises the number of technical actions taken, while imposing a 1-touch limitation increases the number of involvements but also the frequencies of errors and balls lost. The use of goalkeepers reduces the number of technical actions performed when compared with the use of small goals. Moreover, the use of goals on the sides and increases in the length of the field raise the number of sideways passes made. It is also important to highlight that providing verbal instructions about defensive and attacking strategies may significantly increase the number of technical actions performed during SSGs. Comparisons between players of different age groups and expertise levels revealed meaningful differences in the frequency and accuracy of technical actions. Thus, such characteristics should be considered. Finally, it was found that allowing greater periods of recovery between bouts might significantly increase the accuracy and frequency of technical actions during SSGs.

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Conflict of interest

The authors state no conflict of interest.

References

1. Sarmento H, Clemente FM, Harper LD, Costa IT da, Owen A, Figueiredo AJ. Small sided games in soccer – a systematic review. Int J Perform Anal Sport. 2018; 18(5):693–749; doi: 10.1080/24748668.2018.1517288.
2. Clemente FM, Martins FML, Mendes RS. Developing aerobic and anaerobic fitness using small-sided soccer games: methodological proposals. Strength Cond J. 2014;36(3):76–87; doi: 10.1519/SSC.0000000000000063.
3. Davids K, Araújo D, Correia V, Vilar L. How small-sided and conditioned games enhance acquisition of movement and decision-making skills. Exerc Sport Sci Rev. 2013;41(3):154–161; doi: 10.1097/JES.0b013e318292f3ec.
4. Lacome M, Simpson BM, Cholley Y, Lambert P, Buchheit M. Small-sided games in elite soccer: does one size fit all? Int J Sports Physiol Perform. 2018;13(5):568–576; doi: 10.1123/ijspp.2017-0214.
5. Clemente FM, Chen YS, Bezerra JP, Guiomar J, Lima R. Between-format differences and variability of technical actions during small-sided soccer games played by young players. Hum Mov. 2018;19(5):114–120; doi: 10.5114/hm.2018.83103.
6. Clemente FM, Nikolaidis PT, Van Der Linden CMIN, Silva B. Effects of small-sided soccer games on internal and external load and lower limb power: a pilot study in collegiate players. Hum Mov. 2017;18(1):50–57; doi: 10.1515/humo-2017-0007.
7. Serra-Olivares J, Clemente FM, González-Víllora S. Tactical expertise assessment in youth football using representative tasks. Springerplus. 2016;5(1):1301; doi: 10.1186/s40064-016-2955-1.
8. Tan CWK, Chow JY, Davids K. 'How does TGfU work?': examining the relationship between learning design in TGfU and a nonlinear pedagogy. Phys Educ Sport Pedagog. 2012;17(4):331–348; doi: 10.1080/17408989.2011.582486.
9. Badin OO, Smith MR, Conte D, Coutts AJ. Mental fatigue: impairment of technical performance in small-sided soccer games. Int J Sports Physiol Perform. 2016; 11(8):1100–1105; doi: 10.1123/ijspp.2015-0710.
10. Silva P, Aguiar P, Duarte R, Davids K, Araújo D, Garganta J. Effects of pitch size and skill level on tactical behaviours of association football players during small-sided and conditioned games. Int J Sport Sci Coach. 2014;9(5):993–1006; doi: 10.1260/1747-9541.9.5.993.
11. Rowat O, Fenner J, Unnithan V. Technical and physical determinants of soccer match-play performance in elite youth soccer players. J Sports Med Phys Fitness. 2017; 57(4):369–379; doi: 10.23736/S0022-4707.16.06093-X.
12. Hill-Haas SV, Dawson BT, Impellizzeri FM, Coutts AJ. Physiology of small-sided games training in football: a systematic review. Sports Med. 2011;41(3):199–220; doi: 10.2165/11539740-000000000-00000.
13. Aguiar M, Botelho G, Lago C, Maças V, Sampaio J. A review on the effects of soccer small-sided games. J Hum Kinet. 2012;33:103–113; doi: 10.2478/v10078-012-0049-x.
14. Ometto L, Vasconcellos FVA, Cunha FA, Teoldo I, Souza CRB, Dutra MB, et al. How manipulating task constraints in small-sided and conditioned games shapes emergence of individual and collective tactical behaviours in football: a systematic review. Int J Sports Sci Coach. 2018;13(6):1200–1214; doi: 10.1177/1747954118769183.
15. Bujalance-Moreno P, Latorre-Román PÁ, García-Pinillos F. A systematic review on small-sided games in football players: acute and chronic adaptations. J Sports Sci. 2019;37(8):921–949; doi: 10.1080/02640414.2018.1535821.
16. Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Int J Surg. 2010;8(5):336–341; doi: 10.1016/j.ijsu.2010.02.007.
17. Sarmento H, Clemente FM, Araújo D, Davids K, McRobert A, Figueiredo A. What performance analysts need to know about research trends in association football (2012–2016): a systematic review. Sport Med. 2018; 48(4):799–836; doi: 10.1007/s40279-017-0836-6.
18. Ryan R, Synnot A, Prictor M, Hill S. Cochrane Consumers and Communication Group Data extraction template for included studies. Melbourne: La Trobe University; 2016. Available from: http://cccrg.cochrane.org/author-resources.
19. Da Silva CD, Impellizzeri FM, Natali AJ, de Lima JR, Bara-Filho MG, Silami-Garçia E, et al. Exercise intensity and technical demands of small-sided games in young Brazilian soccer players: effect of number of players, maturation, and reliability. J Strength Cond Res. 2011;25(10):2746–2751; doi: 10.1519/JSC.0b013e31820da061.
20. Owen AL, Wong del P, McKenna M, Dellal A. Heart rate responses and technical comparison between small- vs. large-sided games in elite professional soccer. J Strength Cond Res. 2011;25(8):2104–2110; doi: 10.1519/JSC.0b013e3181f0a8a3.
21. Dellal A, Drust B, Lago-Penas C. Variation of activity demands in small-sided soccer games. Int J Sports Med. 2012;33(5):370–375; doi: 10.1055/s-0031-1295476.
22. 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. Int J Perform Anal Sport. 2014;14(3):801–813; doi: 10.1080/24748668.2014.11868759.
23. 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. J Hum Kinet. 2014;41:191–202; doi: 10.2478/hukin-2014-0047.
24. 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. Hum Mov Sci. 2012;31(4):957–969; doi: 10.1016/j.humov.2011.08.013.

25. Owen AL, Wong DP, Paul D, Dellal A. Physical and technical comparisons between various-sided games within professional soccer. Int J Sports Med. 2014;35(4):286–292; doi: 10.1055/s-0033-1351333.
26. Oh SH, Joo CH. Comparison of technical and physical activities between 8 vs. 8 and 11 vs. 11 games in young Korean soccer players. J Exerc Rehabil. 2018;14(2):253–258; doi: 10.12965/jer.1836034.017.
27. Torrents C, Ric A, Hristovski R, Torres-Ronda L, Vicente E, Sampaio J. Emergence of exploratory, technical and tactical behavior in small-sided soccer games when manipulating the number of teammates and opponents. PLoS One. 2016;11(12):e0168866; doi: 10.1371/journal.pone.0168866.
28. Sanchez-Sanchez J, Hernández D, Casamichana D, Martínez-Salazar C, Ramirez-Campillo R, Sampaio J. Heart rate, technical performance, and session-RPE in elite youth soccer small-sided games played with wildcard players. J Strength Cond Res. 2017;31(10): 2678–2685; doi: 10.1519/JSC.0000000000001736.
29. Kelly DM, Drust B. The effect of pitch dimensions on heart rate responses and technical demands of small-sided soccer games in elite players. J Sci Med Sport. 2009;12(4):475–479; doi: 10.1016/j.jsams.2008.01.010.
30. Casamichana D, Castellano J. Time-motion, heart rate, perceptual and motor behaviour demands in small-sides soccer games: effects of pitch size. J Sports Sci. 2010;28(14):1615–1623; doi: 10.1080/02640414.2010.521168.
31. Aslan A. Cardiovascular responses, perceived exertion and technical actions during small-sided recreational soccer: effects of pitch size and number of players. J Hum Kinet. 2013;38:95–105; doi: 10.2478/hukin-2013-0049.
32. Joo CH, Hwang-Bo K, Jee H. Technical and physical activities of small-sided games in young Korean soccer players. J Strength Cond Res. 2016;30(8):2164–2173; doi: 10.1519/JSC.0000000000001319.
33. Martone D, Giacobbe M, Capobianco A, Imperlini E, Mancini A, Capasso M, et al. Exercise intensity and technical demands of small-sided soccer games for under-12 and under-14 players: effect of area per player. J Strength Cond Res. 2017;31(6):1486–1492; doi: 10.1519/JSC.0000000000001615.
34. Jara D, Ortega E, Gomez MÁ, de Baranda PS. Effect of pitch size on technical-tactical actions of the goalkeeper in small-sided games. J Hum Kinet. 2018;62:157–166; doi: 10.1515/hukin-2017-0167.
35. Olthof SBH, Frencken WGP, Lemmink KAPM. Match-derived relative pitch area changes the physical and team tactical performance of elite soccer players in small-sided soccer games. J Sports Sci. 2018;36(14):1557–1563; doi: 10.1080/02640414.2017.1403412.
36. Folgado H, Bravo J, Pereira P, Sampaio J. Towards the use of multidimensional performance indicators in football small-sided games: the effects of pitch orientation. J Sports Sci. 2019;37(9):1064–1071; doi: 10.1080/02640414.2018.1543834.
37. Coutinho D, Gonçalves B, Travassos B, Folgado H, Figueira B, Sampaio J. Different marks in the pitch constraint youth players' performances during football small-sided games. Res Q Exerc Sport. 2019;1–9; doi: 10.1080/02701367.2019.1645938.
38. Dellal A, Chamari K, Owen AL, Wong DP, Lago-Penas C, Hill-Haas S. Influence of technical instructions on the physiological and physical demands of small-sided soccer games. Eur J Sport Sci. 2011;11(5):341–346; doi: 10.1080/17461391.2010.521584.
39. Dellal A, Lago-Penas C, Wong del P, Chamari K. Effect of the number of ball contacts within bouts of 4 vs. 4 small-sided soccer games. Int J Sports Physiol Perform. 2011;6(3):322–333; doi: 10.1123/ijspp.6.3.322.
40. Clemente FM, Wong del P, Martins FM, Mendes RS. Acute effects of the number of players and scoring method on physiological, physical, and technical performance in small-sided soccer games. Res Sports Med. 2014; 22(4):380–397; doi: 10.1080/15438627.2014.951761.
41. 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. J Hum Kinet. 2016;51:153–163; doi: 10.1515/hukin-2015-0178.
42. Pulling C, Twitchen A, Pettefer C. Goal format in small-sided soccer games: technical actions and offensive scenarios of prepubescent players. Sports. 2016;4(4): 53; doi: 10.3390/sports4040053.
43. Abrantes CI, Nunes MI, Maçãs VM, Leite NM, Sampaio JE. Effects of the number of players and game type constraints on heart rate, rating of perceived exertion, and technical actions of small-sided soccer games. J Strength Cond Res. 2012;26(4):976–981; doi: 10.1519/JSC.0b013e31822dd398.
44. Batista J, Goncalves B, Sampaio J, Castro J, Abade E, Travassos B. The influence of coaches' instruction on technical actions, tactical behaviour, and external workload in football small-sided games. Monten J Sports Sci Med. 2019;8(1):29–36; doi: 10.26773/mjssm.190305.
45. Rago V, Rebelo AN, Pizzuto F, Barreira D. Small-sided soccer games on sand are more physically demanding but less technically specific compared to games on artificial turf. J Sports Med Phys Fitness. 2018;58(4):385–391; doi: 10.23736/S0022-4707.16.06708-6.
46. Machado JC, Ribeiro J, Palheta CE, Alcântara C, Barreira D, Guilherme J, et al. Changing rules and configurations during soccer small-sided and conditioned games. How does it impact teams' tactical behavior? Front Psychol. 2019;10:1554; doi: 10.3389/fpsyg.2019.01554.
47. Almeida CH, Ferreira AP, Volossovitch A. Offensive sequences in youth soccer: effects of experience and small-sided games. J Hum Kinet. 2013;36:97–106; doi: 10.2478/hukin-2013-0010.
48. Machado JC, Barreira D, Teoldo I, Travassos B, Júnior JB, Dos Santos JOL, et al. How does the adjustment of

training task difficulty level influence tactical behavior in soccer? Res Q Exerc Sport. 2019;90(3):403–416; doi: 10.1080/02701367.2019.1612511.
49. Köklü Y, Alemdaroğlu U, Dellal A, Wong DP. Effect of different recovery durations between bouts in 3-a-side games on youth soccer players' physiological responses and technical activities. J Sports Med Phys Fitness. 2015;55(5):430–438.
50. Christopher J, Beato M, Hulton AT. Manipulation of exercise to rest ratio within set duration on physical and technical outcomes during small-sided games in elite youth soccer players. Hum Mov Sci. 2016;48:1–6; doi: 10.1016/j.humov.2016.03.013.
51. Özcan İ, Eniseler N, Şahan Ç. Effects of small-sided games and conventional aerobic interval training on various physiological characteristics and defensive and offensive skills used in soccer. Kinesiology. 2018;50(1): 104–111; doi: 10.26582/k.50.1.12.
52. Radziminski L, Rompa P, Barnat W, Dargiewicz R, Jastrzebski Z. A comparison of the physiological and technical effects of high-intensity running and small-sided games in young soccer players. Int J Sports Sci Coach. 2013;8(3):455–465; doi: 10.1260/1747-9541. 8.3.455.
53. Práxedes A, Moreno A, Gil-Arias A, Claver F, Del Villar F. The effect of small-sided games with different levels of opposition on the tactical behaviour of young footballers with different levels of sport expertise. PLoS One. 2018;13(1):e0190157; doi: 10.1371/journal.pone. 0190157.
54. Clemente FM, Sarmento H, Costa IT, Enes AR, Lima R. Variability of technical actions during small-sided games in young soccer players. J Hum Kinet. 2019;69:201–212; doi: 10.2478/hukin-2019-0013.
55. Rampinini E, Impellizzeri FM, Castagna C, Abt G, Chamari K, Sassi A, et al. Factors influencing physiological responses to small-sided soccer games. J Sports Sci. 2007;25(6):659–666; doi: 10.1080/02640410600 811858.
56. Praça GM, Costa CLA, Costa FF, de Andrade AGP, Chagas MH, Greco JP. Tactical behavior in soccer small-sided games: influence of tactical knowledge and numerical superiority. J Phys Educ. 2016;27:e2736; doi: 10.4025/jphyseduc.v27i1.2736.
57. Praça GM, Soares VV, Matias CJA da S, da Costa IT, Greco PJ. Relationship between tactical and technical performance in youth soccer players. Rev Bras Cineantropom Desempenho Hum. 2015;17(2):136–144; doi: 10.5007/1980-0037.2015v17n2p136.
58. Owen AL, Wong del P, Paul D, Dellal A. Effects of a periodized small-sided game training intervention on physical performance in elite professional soccer. J Strength Cond Res. 2012;26(10):2748–2754; doi: 10. 1519/JSC.0b013e318242d2d1.
59. Rabbani A, Clemente FM, Kargarfard M, Jahangiri S. Combined small-sided game and high-intensity interval training in soccer players: the effect of exercise order. J Hum Kinet. 2019;69:249–257; doi: 10.2478/hukin-2018-0092.
60. Clemente FM, Nikolaidis PT, Rosemann T, Knechtle B. Variations of internal and external load variables between intermittent small-sided soccer game training regimens. Int J Environ Res Public Health. 2019;16(16): 2923; doi: 10.3390/ijerph16162923.