Effects of including endurance and speed sessions within small-sided soccer games periodization on physical fitness

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ABSTRACT: The main aim of this study was to analyse the effects of including additional speed and endurance sessions during small-sided games (SSG) training periodization on physical fitness in professional soccer players. Sixteen outfield players (age = 25.6 ± 7.6 years) who competed in the First Division of a European League participated in this study. Players were randomly assigned to perform only the SSG periodization (G-SSG group) or to add endurance and speed training contents to the SSG (ES-SSG group). Before and after the 6-week experimental period, a Yo-Yo Intermittent Recovery Test level 1 (YYIR1) and a 40 m sprinting test were performed. Rating of perceived exertion (RPE) was also measured after each training session. The G-SSG group showed a large improvement in the YYIR1 performance ($p = 0.018–0.028$; ES = 0.521–0.576) after the training programme, whereas no significant changes were observed for the ES-SSG group ($p = 0.763–1.000$; ES = 0.000–0.014). In addition, no significant differences ($p > 0.05$, ES = 0.005–361, trivial to small) in sprint performance at 5 and 10 m intervals up to 40 m were observed at post-training in comparison to pre-training evaluation in G-SSG and ES-SSG groups. No significant differences ($p > 0.05$) between groups were observed at baseline in the YYIR1 test. The 6-week SSG training supported with only six endurance and speed training sessions was no more effective than well-organized SSG alone for improving running endurance in professional soccer players.

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INTRODUCTION

Professional soccer players cover approximately 10–12 km during official matches [1–3], of which almost 1 km takes place at high intensity (> 19.8 $km \cdot h^{-1}$) [4, 5] and approximately 200 m is covered at sprinting intensity (> 25 $km \cdot h^{-1}$) [6]. Moreover, around 80 accelerations [7] and 30 sprints (> 25.2 $km \cdot h^{-1}$) are performed during elite level match-play [8]. Likewise, it has been observed that 83% of goals scored in an elite competitive league were preceded by at least one powerful action, the main one being the straight sprint [9]. Considering the high physical demands encountered by soccer players and the impact of high-intensity actions, coaches should implement appropriate training programmes in order to tolerate the requirements during the development of the official matches [3, 10]. For this reason, the training context in soccer should be focused on gaining positive effects during players' on-field performance. As such, from a conditional standpoint, training should ameliorate the physical conditioning of the soccer players.

Small-sided games (SSG) are smaller and adjusted versions of the official format of the match that aim to introduce or emphasize specific behaviours in the players in the training context [11]. SSG are an effective strategy commonly used in soccer periodization due to their beneficial effects on the players' technical and tactical abilities [12] and physical fitness [13]. The reported benefits of SSG are related to the fact that these tasks are implemented in a specific atmosphere in terms of the presence of team mates and opposition, rules, goalkeepers, score and mean time limit [14]. In order to resemble the physical match demands through these training tasks, SSG are widely implemented by coaches during soccer periodization because SSG are able to modulate some factors which influence the physical demands [15]. Regarding this, the playing space [16], number of players [17], orientation of the game [18], type of marking [19], number of touches [20], duration [16], presence of floaters [18], and/or order of presentation within a session [21] are some of the factors to consider when designing SSG. In addition, SSG are appropriate training strategies to facilitate the reproduction of tactical behaviours and principles of the game in order to develop the style of game of the teams, also achieving improvement in the players' physical conditioning [22].

To periodize SSG within a certain time period could be appropriate to induce training adaptations in cardiovascular parameters in comparison to isolated training programmes based on generic and analytical conditional exercises [12, 23]. In this sense, the literature has demonstrated that a 4–8-week training period based on SSG tasks is equally effective to develop the aerobic capacity measured by maximal and submaximal endurance tests in soccer players than high-intensity training, repeated-sprint training, interval training and aerobic training [24–26]. Moreover, the use of SSG as a training methodology has shown positive effects on the repeated sprint ability and on the change of direction ability thanks to the improvement or the maintenance of performances [27–29]. However, no substantial improvements were found in the sprint performances (i.e., 5, 10 and 30 m sprint) [30] or in the vertical jump performance [26] after an 8-week SSG training programme in young soccer players. Current research has reported the effects of soccer-specific (i.e., SSG periodization) over traditional training methods (i.e., training programmes without a ball); however, it would be interesting to know whether conditional training contents in addition to SSG is beneficial to obtain greater improvements in the players' physical condition. Also, it has been observed that players with greater aerobic capacity did not show improved performance after a 4-week SSG programme; otherwise, the responders were those players with worse aerobic performance [25]. To date, there have been limited studies which investigated a combination of SSG and running-based high intensity exercise, showing meaningful benefits for aerobic capacity [31, 32]. However, more research should be conducted testing other approaches and combinations and comparing the effects of combined tasks with isolated ones. Such findings may provide important information to coaches and sports scientists in order to increase the overall understanding of the effects of isolated or combined SSG in soccer players.

Considering the aforementioned information focused on the improvements on physical fitness after SSG periodization, and the scarcity of literature about the cardiovascular effects of performing complementary analytical training based on physical capacities, the main aim of this study was to analyse the effects of including additional speed and endurance sessions during small-sided games (SSG) training periodization on physical fitness in professional soccer players. We hypothesize that inclusion of additional conditional training contents to the normal SSG training will improve the aerobic fitness and power performances of professional soccer players.

MATERIALS AND METHODS

Experimental design

A randomized quasi-experimental pre-post design was used to analyse the effects of including additional sessions of speed and endurance during SSG periodization on the aerobic and sprint performances. The training protocol was established over 6 weeks during the second part of the competitive season, since in this period generally no significant changes in aerobic performance have been observed [33]. Players were randomly assigned to perform only the SSG training periodization (G-SSG group) or additional endurance and speed training contents to their normal SSG training (ES-SSG group). In addition to the proposed training programmes, all players continued participating in their usual training (technical and tactical) sessions and official matches. To assess the effectiveness of both training programmes, a 40 m sprinting test and a Yo-Yo Intermittent Recovery Test level 1 (YYIR1) were performed before and immediately after the 6-week intervention. Before each test session, players undertook a 20-minute standardized warm-up, consisting of 7 minutes of slow jogging and strolling locomotion, followed by 10 minutes of specific soccer drills, to finish with 3 minutes of progressive sprints and accelerations. In the 48 h before the test sessions, players were advised not to perform any type of physical exercise and to ensure that they were fully hydrated and energized. All participants had performed the tests on at least one occasion before the training sessions. All tests were performed on a soccer pitch with synthetic turf (15–20ºC, 60–70% humidity). The training sessions were performed always at the usual training time of the team (21:00–22:30 hours), with the players wearing their training uniforms and soccer boots to play on the artificial grass field on which they normally trained. During the 6-week study intervention, the players were instructed to maintain their usual habits, which included 8 hours of night-time sleep before each data collection session, adequate hydration, and carbohydrate intake [3]. Rating of perceived exertion (RPE; Foster 0–10 scale) was also measured after each training session.

Participants

Sixteen outfield professional soccer players (age = 25.6 ± 7.6 years; experience: 15.6 ± 3.4 years; height = 177 ± 5 cm; body mass = 69.3 ± 6.7 kg), who competed in the First Division of an European League and belonged to the same team, participated in the study (statistical power > 0.80). All players had a minimum of 10 years of experience in competitive soccer. Players (i.e., eight defenders, six midfielders and four forwards) trained four times a week (~90 min each session) and were involved in an official match on Saturdays. Players were randomly assigned as performing only SSG (G-SSG, age = 25.4 ± 7.5 years; height = 180 ± 8 cm; body mass = 70.3 ± 6.7 kg; playing time in matches = 82.3 ± 12.7. min) or the group characterized by additional endurance and speed training contents to their normal SSG training (ES-SSG, age = 26.1 ± 7.8 years; height = 175 ± 7 cm; body mass = 69.0 ± 6.7 kg; playing time in matches = 75.8 ± 14.2 min). The inclusion criteria required players to take part in all training sessions throughout the six-week period and that participants did not report any injury throughout the two months prior to the SSG training intervention, so 100% compliance was required. Goalkeepers were excluded from the study, although they participated in the training sessions. All participants were informed of the procedures, methods, benefits, and possible risks involved in the study before giving their written consent. The study was performed in accordance with the Declaration of Helsinki (2013) and approved by the Ethics Committee of the University (Code: UI1-PI001).

Measures

Sprinting Test. Considering that senior players achieve their maximal speed over a distance of 30–40 m [34], the 40 m sprint test (SPR40) can be assumed to be a suitable test to assess participants' sprint ability [35]. In addition, with the aim to assess the acceleration capacity and other sprint performances, the time taken to cover 5 (SPR5), 10 (SPR10), 15 (SPR15), 20 (SPR20) and 30 (SPR30) m distances was also recorded [36, 37]. Soccer players performed three sprints over 40 m distance with 90 s rest and the fastest trial was used for analysis [34]. The *MySprint* app installed on an iPhone 8 running iOS 13.1.3 and filmed with the iPhone's built-in 240 fps high-speed camera at a quality of 720p was used. To record the video of each sprint with split times, the protocol and procedures described by Romero-Franco et al. [38] were followed. All the measurements were taken by the same person. The coefficient of variation (CV) among the three repetitions for the 5, 10, 15, 20, 30 and 40 m sprinting test was calculated as 2.46, 2.43, 2.48, 2.05, 2.00 and 1.78%, respectively, and the intraclass correlation coefficient (ICC) was obtained in a range of 0.91 and 0.99 for the sprint tests. Also, a previous investigation reported high values of validity and reliability [38].

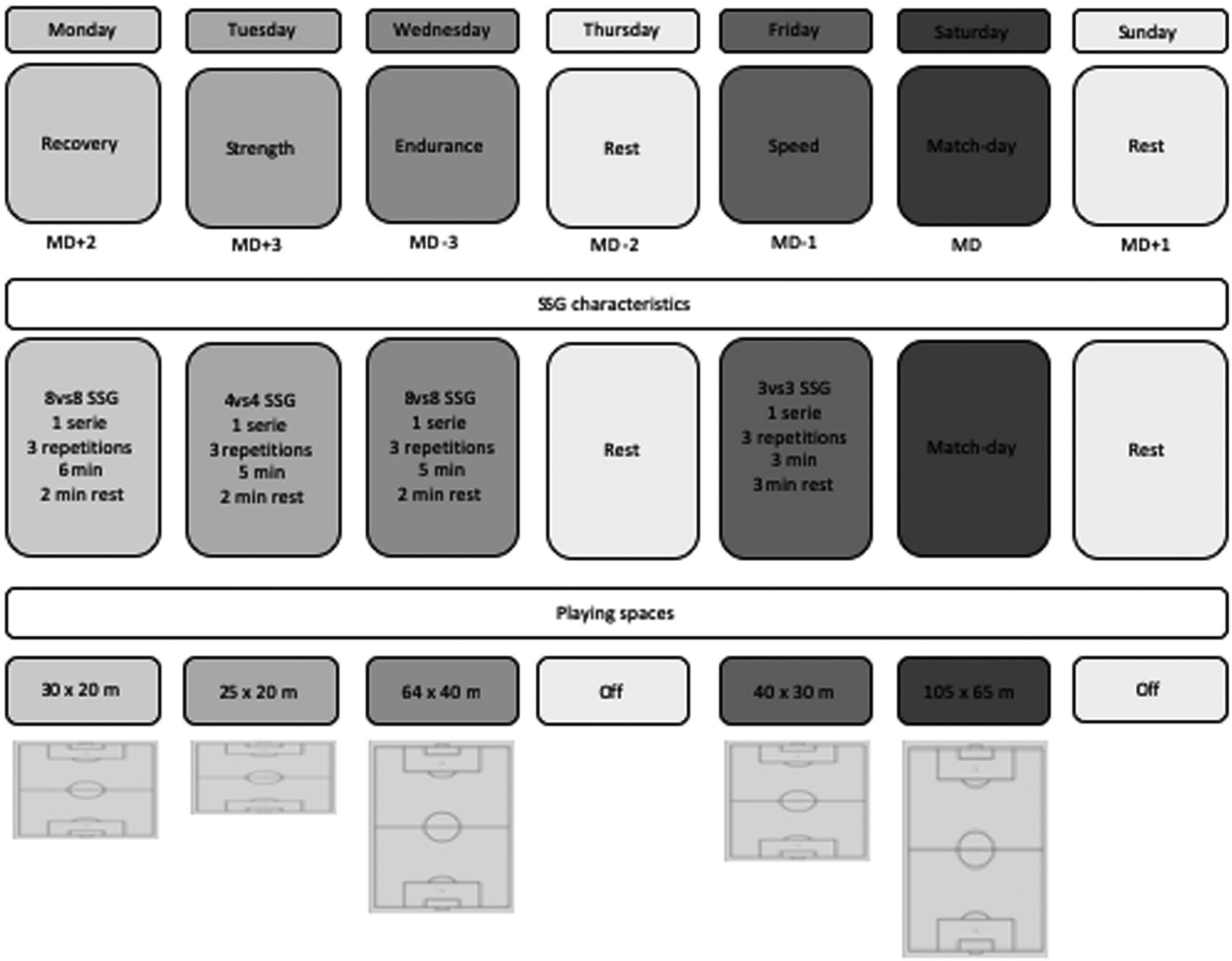

FIG. 1. Distribution of the small-sided games (SSG) training contents through the microcycle in both experimental groups. MD: match day; MD+2: two days after the match day; MD+3: three days after the match day; MD-3: three days before the match day; MD-1: one day before the match day.

Yo-Yo Intermittent Recovery Test Level 1 (YYIR1). The YYIR1 consisted of 2 x 20 m runs back and forth between two lines at a progressively increasing speed controlled by audio bleeps [39]. When the players twice failed to reach the corresponding line in time, the distance covered was recorded and represented the test result. Each bout was interspersed with a 10 s active rest period consisting of 2 x 5 m of jogging. The total distance covered during the YYIR1 (including the last incomplete shuttle) and the last level achieved by the player were taken as the testing scores [40].

SSG training periodization

The SSG training programme was conducted over 6 weeks maintaining the same distribution of the training contents in each week. Based on previous studies [3, 10], which examined the representative 3 typical conditioned sessions (i.e., strength, endurance, and speed) targeting each of the 3 main physical capacities, this soccer training periodization model was adopted. The distribution of the SSG training contents along the microcycle in both experimental groups (G-SSG and ES-SSG) is shown in Figure 1. The SSG training programme was planned and implemented by the coach [26]. All SSG were played with coach encouragement, without the offside rule being enforced and the coach introduced balls immediately when the ball left the playing field [16]. The playing space and the number of players used in each training session are shown to explain the horizontal alternation of conditional contents within the same typical training week, in relation to the match day (MD). In this respect, training two days after the MD (MD+2) was focused on recovery, three days after the MD (MD+3) it was focused on neuromuscular demands, three days before the MD (MD-3) it was focused on the endurance components, and the day before the match (MD-1) it was focused on speed actions.

Additional endurance and speed training

While the G-SSG group only performed the SSG training programme, the ES-SSG group performed additional endurance and speed training in Tuesday's sessions. This training lasted around 15 minutes and was characterized by high-intensity training (endurance) [26] and sprints actions (speed) [41] during the 6-week intervention period. Endurance contents were implemented in weeks 1, 3 and 5, and speed sessions were included in weeks 2, 4 and 6. The characteristics of these additional training contents in the ES-SSG group in terms of volume and intensity are described in Table 1.

Rating of perceived exertion (RPE)

In order to quantify the SSG training programme's intensity, Foster's 0–10 scale was used [42]. Players responded to the question "How hard was the training session?" 10 min after every training session [43]. Players were allowed to mark a plus sign (interpreted as 0.5 points) alongside the integer value [44]. The same person was responsible for asking the question of the players, (i.e., strength and conditioning coach). Each player completed the 0–10 scale randomly without the presence of other players and could not see the values of other participants. All players were familiarized with this method during the last two months in training sessions and official competition.

Statistical analysis

Results are presented as means ± standard deviations (SD). Normal distribution was tested using the Shapiro-Wilk test and the homogeneity of variances was tested by the Levene test. The percentages of changes (Δ%) between the results before (Pre) and after (Post) the training period were calculated with the following formula: Δ% = ((Post-Pre)/Pre)*100. The independent samples *t*-test was used to compare the training load, measured by RPE, between the G-SSG and ES-SSG during the training period. A 2-way repeated measures analysis of variance (ANOVA) with training group (2 levels, G-SSG and ES-SSG) and time effect (before, Pre, and after, Post, training) was used to compare the effect of training programmes. When a significant interaction was noted, the Bonferroni post hoc test was conducted. Statistical significance was set at $p < 0.05$. Effect sizes (ES) were calculated using Cohen's ES to quantify the magnitude of the difference among groups in physical match performance [45]. ES of above 0.8, between 0.8 and 0.5, between 0.5 and 0.2, and lower than 0.2 were considered large, moderate, small and trivial, respectively [45]. The data analysis was carried out using SPSS 25.0; SPSS Inc., Chicago, IL, USA.

TABLE I. Characteristics of the additional training contents in ES-SSG group.

Weeks	Content	Description	Work periods	Recovery
1, 3, 5	Endurance	High-intensity training: 50 m – maximal intensity 50 m – active running	2 x 8 min	3 min
2, 4, 6	Speed	4 sprints of 15 m 4 sprints of 30 m 4 sprints of 40 m	3 series x 4 repetitions	30 s between repetitions 3 min between series

ES-SSG: endurance and speed training contents to their normal SSG training.

RESULTS

Post hoc analysis revealed that in the G-SSG group there was a significant improvement in the YYIR1 performance ($p = 0.018$–0.028; ES = 0.521–0.576, moderate) after the training programme, whereas no change was observed for the ES-SSG group ($p > 0.05$) (Table 2). No significant differences ($p > 0.05$) between groups (i.e., G-SSG and ES-SSG) were reported at baseline in the YYIR1 test.

No significant differences ($p > 0.05$) in sprint performances (i.e., SPR5, SPR10, SPR15, SPR20, SPR30 and SPR40) were observed after the experimental period in G-SSG and ES-SSG groups (Table 3). In addition, no significant differences ($p > 0.05$) were found at the baseline between the experimental groups (i.e., G-SSG and ES-SSG).

Higher RPE ($p < 0.01$) was significantly observed on Tuesday for ES-SSG (RPE = 7.80 ± 0.47) in comparison to G-SSG

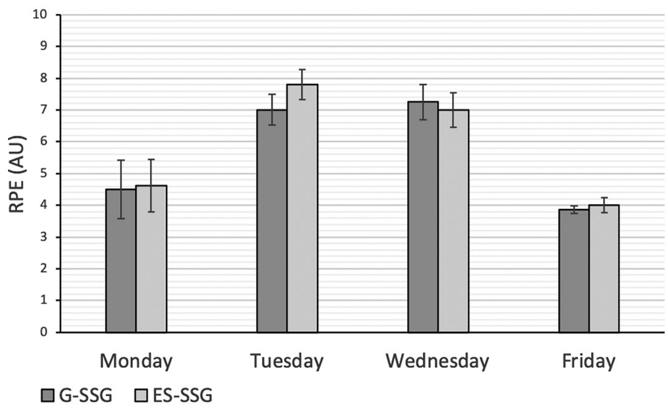

FIG. 2. Rating of perceived exertion (RPE) of each training session. G-SSG: SSG training periodization; ES-SSG: endurance and speed training contents in their normal SSG training.

TABLE II. Yo-Yo intermittent recovery level 1 (YYIR1) performance before (Pre) and after (Post) the training in both experimental groups.

Variable	Group	Pre	Post	Δ (%)	p	ES
$YYIR1_{level}$	G-SSG (n = 8)	19.83 ± 1.41	19.95 ± 1.45	0.63	0.028	0.521
	ES-SSG (n = 8)	18.99 ± 1.73	18.99 ± 1.77	0.00	1.000	0.000
$YYIR1_{distance}$	G-SSG (n = 8)	2330.75 ± 445.10	2372.50 ± 464.30	1.79	0.018	0.576
	ES-SSG (n = 8)	2063.25 ± 554.11	2069.75 ± 561.86	0.32	0.763	0.014

$YYIR1_{level}$: level reached in the Yo-Yo intermittent recovery level 1 test; $YYIR1_{distance}$: distance covered in the Yo-Yo intermittent recovery level 1 test; Δ (%): percentage of change between pre and post training performance; p: level of significance; ES: effect size; G-SSG: small-sided games group; ES-SSG: small-sided games group with additional endurance and speed contents.

TABLE III. Sprint performances before (Pre) and after (Post) the training in both experimental groups.

Variable	Group	Pre	Post	Δ (%)	p	ES
SPR5	G-SSG	2.05 ± 0.73	1.97 ± 0.65	-4.24	0.282	0.163
	ES-SSG	2.15 ± 0.51	2.09 ± 0.42	-2.62	0.798	0.010
SPR10	G-SSG	2.84 ± 0.75	2.76 ± 0.76	-2.96	0.261	0.176
	ES-SSG	2.89 ± 0.53	2.82 ± 0.42	-2.59	0.756	0.016
SPR15	G-SSG	3.54 ± 0.73	3.47 ± 0.72	-1.97	0.286	0.160
	ES-SSG	3.57 ± 0.50	3.48 ± 0.40	-2.38	0.708	0.021
SPR20	G-SSG	4.34 ± 0.77	4.27 ± 0.79	-1.65	0.168	0.252
	ES-SSG	4.14 ± 0.47	4.10 ± 0.39	-1.00	0.858	0.005
SPR30	G-SSG	5.40 ± 0.72	5.26 ± 0.49	-2.54	0.252	0.182
	ES-SSG	5.33 ± 0.53	5.26 ± 0.39	-1.29	0.782	0.012
SPR40	G-SSG	6.66 ± 0.66	6.36 ± 0.52	-4.48	0.087	0.361
	ES-SSG	6.49 ± 0.44	6.42 ± 0.38	-1.10	0.688	0.024

SPR: sprint; Δ (%): percentage of change between pre and post training performance; p: level of significance; ES: effect size; G-SSG: small-sided games group; ES-SSG: small-sided games group with additional endurance and speed contents.

(RPE = 7.01 ± 0.48) (Figure 2), but no significant differences ($p > 0.05$) were found for the other training days.

DISCUSSION

The aim of this study was to analyse the effects of including endurance and speed sessions in the SSG training periodization on physical fitness in professional soccer players. This is one of the first investigations to analyse the effects of including additional training based on speed and endurance contents in the regular SSG periodization over a 6-week period on the physical condition of professional soccer players. The main results showed improvements in the YYIR1 performance after the experimental period in the G-SSG group, but no changes were found in the ES-SSG group. In addition, no variations were observed in the sprint performances (i.e., SPR5, SPR10, SPR15, SPR20, SPR30 and SPR40) at post-training in comparison to pre-training evaluation in G-SSG and ES-SSG groups. Also, greater RPE values were reported on Tuesday for ES-SSG but no differences were observed on the other training days. These findings may provide practical information to coaches in order to apply and periodize the SSG during soccer training programmes.

Given that soccer activity is characterized by great aerobic demands and high-intensity actions [1–3], training tasks should be designed appropriately to allow players to be prepared for the competition demands [3, 46]. Most studies are in line with our results, which indicate that SSG training programmes could be an appropriate training method to induce cardiovascular adaptations in soccer players [24, 26, 41], with the advantage of involving players in a soccer-specific context characterized by the integration of physical, technical-tactical and decisional aspects [14]. In our investigation, the players who composed the G-SSG group showed significantly improved performance in the YYIR1 in comparison with their baseline level whereas no change was observed for the ES-SSG group. In line with this, Hill-Haas et al. [41] reported improvements in the YYIR1 performance after a 7-week SSG programme based on the combination of small, medium and large pitch sizes for the SSG, as we adopted in the methodology of our study. On the other hand, other investigation showed that the inclusion of 25 min of SSG twice a week in the players' regular training sessions was as effective as interval training, due to elite young soccer players maintaining the performance in continuous maximal multistage running field tests after a 6-week training intervention [26]. Dellal et al. [24] demonstrated that the addition of an intervention to the players' usual training of SSG or high-intensity were equally effective in developing the speed reached at the end of an aerobic test (i.e., VAMEVAL) and the ability to perform intermittent exercises with changes of direction in male amateur soccer players. Likewise, similar improvements in VO_2max (~6%) were observed after 8 weeks of skill-based training or SSG in under 15 amateur young players during the pre-season period [47]. Also, Arslan et al. [48] reported improvements of ~3% in the 1000 m running test after 5-week SSG training in under 14 young regional players; however, players composing the high-intensity intermittent training group showed improvements in the cardiovascular test of ~6%. Considering the aforementioned studies, it seems that periodization of SSG could be as effective as including additional work of SSG to normal training in order to improve or maintain the endurance capacity in young/senior and amateur/elite soccer players.

Although larger improvements in aerobic capacity were observed in the G-SSG group, no differences in the YYIR1 performance were observed in the ES-SSG group. This suggests that including additional speed and endurance training contents during SSG periodization does not improve the aerobic capacity in professional soccer players. The lack of difference in the ES-SSG group in aerobic capacity in comparison to the group which only performed SSG periodization (i.e., G-SSG group) could be explained by an increase of the extra workload imposed on the ES-SSG group. In line with this, our results demonstrated higher RPE values on Tuesday for ES-SSG in comparison to G-SSG, but no differences were found for the other training sessions. A previous study showed that replacing 30 s within the 4-min bouts of SSG (both 3- and 4-a-side) with 2 x 15 s of running drills was effective in increasing internal (blood lactate and RPE) and external loads (moderate and high-intensity running) in young soccer players [49]. Bearing these findings in mind, it would be advisable to use a tapering strategy during the last 2 weeks of the intervention in amateur and professional soccer players, by reducing exponentially the training volume by 41–60% while maintaining both the intensity and the frequency of sessions, in order to maximize performance gains [50–52]. It could be that a unique endurance stimulus every 15 days is not sufficient to induce positive effects on the endurance capacity. In fact some authors [53] have demonstrated the necessity of at least two specific endurance sessions per week.

Since the straight sprint is the most decisive action leading to a goal [9], the assessment of the sprinting ability is an adequate alternative to quantify the physical performance in elite soccer players [34, 54]. In our investigation, the G-SSG group did not improve the sprint performances after the SSG periodization. These results are in consonance with a previous study which demonstrated that soccer players did not improve the sprint performance at distances of 5, 10 and 30 m after an 8-week SSG training programme compared with interval running in U16 soccer players [55]. Nor did Karahan et al. observe improvements in a 20 m straight sprint test after 8 weeks based on SSG in under 15 amateur young players during preseason [47]. It is well known that sprint running performance is clearly influenced by the anthropometric characteristics [56] (i.e., the product of stride rate and stride length), initial training status [57] and physical fitness [58] among others. Additionally, performance in sprinting ability has traditionally been believed to be largely dependent on genetic factors, with only relatively small improvements occurring with training [56]. Moreover, the individual adaptation potential of each player clearly influences the effects of a training programme, making it more difficult to achieve improvements with highly trained professional athletes [56]. On the other hand, as occurred in the G-SSG group, no significant differences were observed in sprint performances after the experimental period in the ES-SSG group. Thus, a novel finding of this investigation is the fact that the inclusion of additional training sessions based on speed and endurance contents does not improve or decrease the sprinting ability in elite soccer players. The lack of effect of this training regimen could be explained by the fact that speed and endurance contents distributed within this schedule generate two possible different adaptation mechanisms simultaneously, producing a possible interaction effect between them [59]. In this regard, endurance training appearing to induce a shift toward type I muscle fibres [60], while speed training favours the change of the myosin heavy chain isoforms in individual muscle fibres towards greater type IIb expression, which is associated with the increase of sprint performance [61]. Additionally, it seems that a speed stimulus every 15 days is not sufficient to induce an increase in the proportion of type II muscle fibres [62]. Possibly, it would be necessary to design training blocks focused on sprinting, including a greater number of speed sessions or specific sessions involving strength exercises, plyometrics and running technique in a soccer training context in order to ameliorate the sprint capacity in professional soccer players. Further research could include a longer rest period between SSG, add additional speed sessions or implement concurrent training changing the order of stimulus. Likewise, appropriate periodization of the training tasks (i.e., SSG) seems to be sufficient to maintain the sprint performance with the advantage of resembling the soccer-specific context. This information could be really interesting for soccer staff members due to the practical approaches in their training periodization; however, further studies would be useful to understand the training process in this team sport.

Although the topic addresses the recent concerns of soccer coaches, that is, the influence of SSG periodization on the professional soccer players' physical condition and the effects of adding conditional training sessions to the soccer-specific programmes, several limitations in this area of expertise must be taken into account. The main one, similar to previous studies, was the small number of players in each group, and consequently, the difficulty to establish general conclusions applied for all soccer teams and competitive levels. However, the major strength of this study was the professional level of the team recruited for this investigation. Another limitation was the non-replication of this SSG periodization in other periods of the competitive season, in order to determine the best time to apply this training intervention. In addition, the use of global positioning systems during training sessions to adjust the training load would be interesting to understand the training process and to apply specific training loads in each training session. In addition, another limitation was the necessity to quantify the physical and physiological demands encountered by players during a competition. As such, it is not possible to understand the influence of match loads on the results reported in the present study. Finally, since the specific soccer-context plays an important role in the training process, it should be considered in applied scientific research.

CONCLUSIONS

From a practical approach, an isolated 6-week period of daily (i.e., 4 days per week) SSG periodization was superior to incorporating additional training sessions (i.e., speed and endurance each 15 days, separately) in order to improve intermittent endurance performance without a negative or positive impact on sprint performance at several distances (i.e., 5, 10, 15, 20, 30 and 40 m). Therefore, appropriate SSG periodization is effective to ameliorate the endurance capacity without influencing the sprint ability. These findings may provide practical information to coaches in order to apply SSG programmes in their soccer training periodization.

Conflict of interests

The authors declared no conflict of interests regarding the publication of this manuscript. There are no funding sources and are no conflicts of interest surrounding this scientific investigation.

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