THE INFLUENCE OF THE FLOATER POSITION ON THE LOAD OF SOCCER PLAYERS DURING A 4 VS 4 + 2 GAME

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Abstract:

The purpose of this study was to examine the load of regular players and floater players in a specific small-sided game. Twenty semi-professional soccer players performed one 4vs4+2, modifying the position of the floaters (internal, external, zone, square and without floaters). Total distance covered, distance covered at speeds between 7-13.9 km·h^{-1}, 14-17.9 km·h^{-1}, and ≥18 km·h^{-1}, accelerations and decelerations between 2.5-4 m·s^{-2}, maximal and mean heart rate (HR) and rating of perceived exertion (RPE) were analyzed. Internal floaters achieved greater total distance covered, accelerations and RPE than in any other position. Internal and external floaters achieved more distance covered at 7-13.9, 14-17.9, >18 km·h^{-1} and HR than zone and square floaters. With internal floaters, regular players covered more distance covered >18 km·h^{-1} than in any other 4vs4+2 format, and with internal and external floaters regular players covered greater total distance and distance at 14-17.9 km·h^{-1} than without floaters or with zone or square floaters. Regular players showed greater total distance covered, distance covered at 7-13.9, 14-17.9, >18 km·h^{-1}, accelerations and RPE than floaters in all 4vs4+2. These data showed that floater position in 4vs4+2 game influenced the internal and external load of both the regular players and the floaters.

Key words: *football, time-motion, global position system (GPS), heart rate, rate of perceived exertion*

Introduction

Soccer is a sport that can be considered as a set of complex, self-organized, unstable, unpredictable and highly dynamic systems in which players interact with each other trying to achieve offensive and defensive maneuvers (Davids, Araujo, Correia, & Vilar, 2013; Vilar, Araujo, Davids, & Button, 2012). Sometimes, that interaction can be understood as random and stochastic (Low, et al., 2020; Mackenzie & Cushion, 2013; Yue, Broich, Seifriz, & Mester, 2008), so one of the most important issues in enhancing performance in soccer is the incorporation of training drills that totally or partially mimic the requirements of a formal competition (Katis & Kellis, 2009), to obtain stimuli that would provide the maximum benefits for the soccer player with regard to real-world matches (Mallo & Navarro, 2008; Turner & Stewart, 2014).

Small sided games (SSGs) are among the most frequently applied and most popular training exercises used by soccer coaches (Clemente, et al., 2020; Clemente, Praca, Bredt, van der Linden, & Serra-Olivares, 2019; Owen, Newton, Shovlin, & Malone, 2020; Praca, Andrade, Bredt, Moura, & Moreira, 2022; Rampinini, et al., 2007; Sarmento, et al., 2018) because, like matches, SSGs provide players with opportunities for continuous exploration, discovery and learning of specific situations (Ric, Hristovski, & Torrents, 2015; Rico-Gonzalez, Pino-Ortega, Praca, & Clemente, 2022) while simultaneously aiming at the development of technical, tactical, and physical components (Dellal, et al., 2008; Hill-Haas, Rowsell, Dawson, & Coutts, 2009). SSGs are modified games played on a reduced-size field, often involving a smaller number of players and introducing adapted rules, which are different from regular eleven-a-side games (Hill-Haas, Dawson, Impellizzeri, & Coutts, 2011). In recent years, the available research on manipulating the game rules applied during SSGs has increased significantly (Aguiar, Botelho, Lago, Macas, & Sampaio, 2012; Castillo, Raya-Gonzalez, Manuel Clemente, & Yanci, 2020; Coutinho, et al., 2020; Hill-Haas, et al., 2011; Sarmento, et al., 2018). Most studies have been carried out in teams with the same numbers of players (Torres-Ronda, et al.,

2015) even though soccer is frequently played in numerical imbalance, either temporarily or permanently (Sampaio, Lago, Goncalves, Macas, & Leite, 2014), and despite the fact that coaches regularly use floater players to regulate the load on some players (Lacome, Simpson, Cholley, & Buchheit, 2018). Only a few studies have investigated the internal and external loads during SSGs of such formats. Hill-Haas, Coutts, Dawson, and Rowsell (2010) showed that floaters covered greater total distances and engaged in more sprints than regular players (RP), comparing various SSG formats with different number of players, dissimilar pitch sizes and rule changes. Only two of four SSG formats used had one floater, so we cannot compare floaters' vs RPs' demands in the results obtained in Hill-Haas et al.'s study (Hill-Haas, et al., 2010). Lacome et al. (2018) recently demonstrated that locomotor activity and external mechanical load were lower in floaters than in RP in SSGs with one floater, depending on pitch size variations, which modified the number of players, and the inclusion of a goalkeeper. Keeping the total size of the field but modifying the length-width orientation in SSGs, Gollin, Alfero, and Abate Daga (2016) detected a lower load in internal floaters than in RP. Similar results have been found for internal floaters when the orientation of the SSGs is kept (Rabano-Munoz, Asian-Clemente, Saez de Villarreal, Nayler, & Requena, 2019). Internal load parameters, measured as rating of perceived exertion (RPE) and heart rate (HR), and technical demands have been also analyzed, comparing SSG + 2 internal floaters, SSG + 2 internal and 2 external floaters, and SSG without floaters (Sanchez-Sanchez, et al., 2017). However, we are not aware of any study that has compared floaters' internal and external loads with those of RPs depending on their position in SSG formats with the same pitch size, the number of players and rules. Since it is common for coaches to change floaters' positions during SSGs, it is of interest to determine the effect of the floater role on RP and floater's demands during SSGs, isolating this from other influencing variables.

Therefore, the purpose of this study was to examine acute physiological responses and time-motion characteristics of RPs and floaters, and their relationship to the position of the floater, during a 4vs4+2 with the same pitch size, the number of players and rules.

Material and methods

Participants

Twenty semi-professional male soccer players (age: 24.1 ± 3.5 years; body height: 177.2 ± 5.9 cm; body weight: 70.3 ± 8.2 kg; % body fat [Faulkner, 1968]: 11.5 ± 1.9) from the same team participated in the study. All players were informed on the aims of the study and gave their informed consent before starting. The study was approved by the local ethical committee of the University of Pablo de Olavide and was developed according to the principles of the Declaration of Helsinki for the study with human subjects.

Procedures

Data were collected during the first half of the competitive season 2017-2018. Players were involved in five training sessions per week (80-120 minutes) plus one competitive match (played on Sunday). To guarantee the recovery of the players, measurements took place at the same time of the week after the rest day (Wednesday). All these sessions started by assigning the same GPS to the players to limit measurement errors, continued with a similar 20-min standardized warm-up and were completed on the natural turf at the same time of a day. After the warm-up, the players' behavior in SSGs was monitored and the session finished with a conditioned game with high technical and tactical requirements.

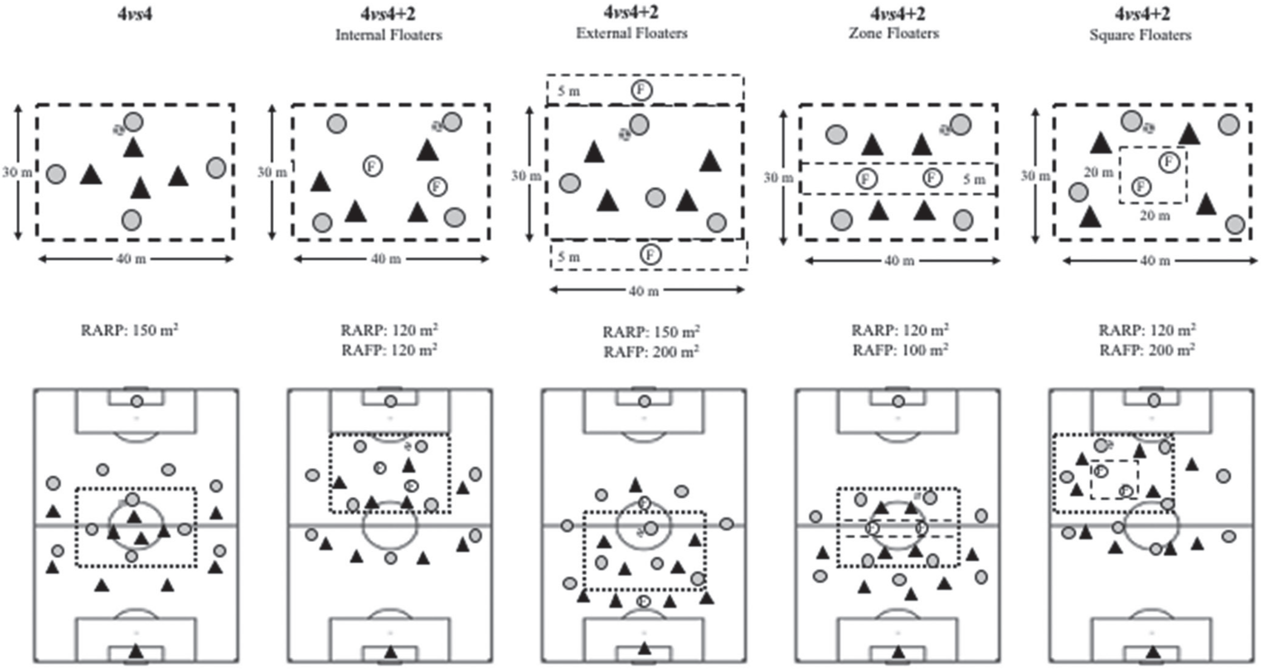
Small-sided games

Five SSGs were implemented over the duration of the study (Figure 1). On each drill monitored a representative moment of the game was represented. Training tasks were designed by technical staff to ensure the transference to the match by following specificity principle. The teams in the SSGs were balanced according to players' technical and tactical level, competitive experience, playing positions (Dellal, et al., 2012) and the subjective evaluation of the coaches (Casamichana & Castellano, 2010). The role of floaters was assigned to the same players during the study, who were chosen by the coaches.

Teams of four players aimed to retain ball possession, with the incorporation of two floaters, who always assumed an offensive role (Campos-Vazquez, et al., 2017). The pitch size (40 x 30 m) and the duration (four bouts of 4-min, separated by 2-min of passive recovery) were constant in all the SSGs (Kelly & Drust, 2009; Sanchez-Sanchez, et al., 2017). SSGs were performed with no limit on ball touches and no player-to-player marking. Coaches verbally encouraged the players to maintain a high work rate during the SSG bouts.

Locomotor activity

Running activity parameters were monitored using a GPS system (GPSports SPI Elite System, Canberra, Australia) previously validated in the literature (Barbero-Alvarez, Coutts, Granda, Barbero-Alvarez, & Castagna, 2010; Coutts & Duffield, 2010). Total distance covered (TD), and



Note. SSGs format: a) 4vs4; b) 4vs4 + 2 internal floaters; c) 4vs4 + 2 external floaters; d) 4vs4 + 2 zone floaters; e) 4vs4 + 2 square floaters. **Grey points: regular players in possession of the ball. Black triangles: regular players defending**. White points: floaters (attacking). RARP = Relative area regular players; RAFP = Relative area floater players

Figure 1. Graphical representation of the formats of the SSGs.

distances covered (DC) at several speeds: DC at 7-13.9 km·h^{-1}, 14-17.9 km·h^{-1}, and ≥ 18 km·h^{-1} (Casamichana, Castellano, & Castagna, 2012). Accelerations and decelerations between 2.5-4 m·s^{-2} were also recorded (Buchheit, et al., 2014; Suarez-Arrones, et al., 2016).

Heart rate (HR) and rate of perceived exertion (RPE)

Maximal (HR_{max}) and mean (HR_{mean}) heart rates achieved by players during the SSGs were obtained using a short-range radio telemetry (1 Hz, Polar Team Sports System, Polar Electro Oy, Finland) and integrated in the GPS units across the games. The 1-10 Borg Scale for RPE was used to assess the global SSG internal load (Borg, Hassmen, & Lagerstrom, 1987; Foster, et al., 2001). Players, having already been familiarized with that scale, gave their evaluations immediately after each game using a standardized questionnaire (Coutts, Rampinini, Marcora, Castagna, & Impellizzeri, 2009).

Statistical analyses

Data are presented as mean ± standard deviation (SD). All variables showed a normal distribution (Shapiro-Wilk test). A one-way analysis of variance (ANOVA) was used to determine variations in the TD, DC in each speed zone, number of accelerations and decelerations, HR and RPE. Cohen's effect size (ES) was also calculated to compare the magnitudes of the change between groups in certain variables, and quantitative differences were assessed (Hopkins, Marshall, Batterham, & Hanin, 2009). Threshold values for assessing magnitudes of the ES were < 0.20, 0.20, 0.60, 1.2, and 2.0 for trivial, small, moderate, large, and very large, respectively (Hopkins, et al., 2009). The SPSS statistical software package (V20.0 for Windows, SPSS Inc., Chicago, IL) was used for data analysis.

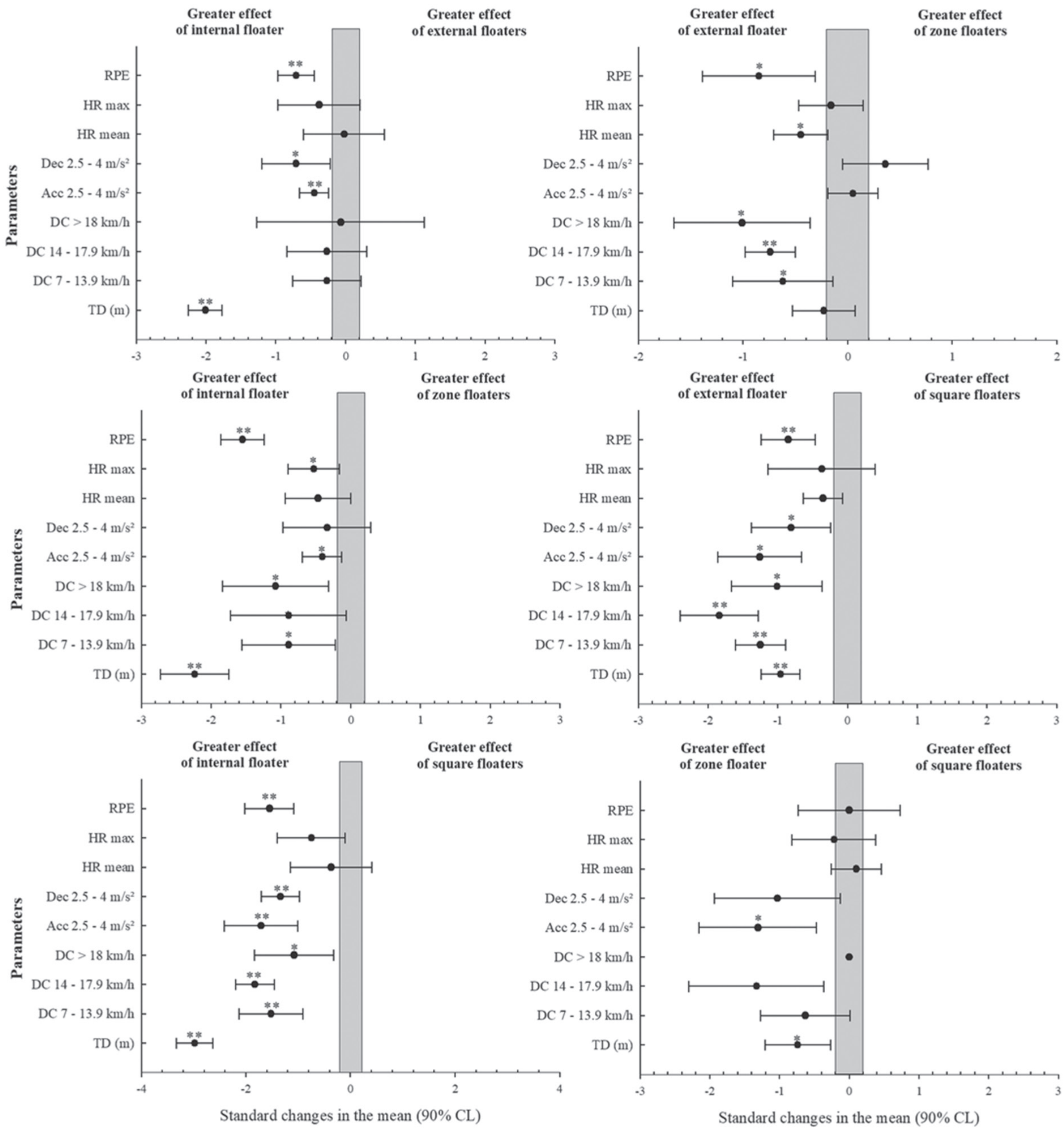
Results

Comparisons between floater players

Table 1 and Figure 2 show the external and internal loads of floaters depending on their position in the 4vs4+2 SSGs. Total distance (TD), number of accelerations and RPE were statistically higher in the internal floaters than in any other position (very large to small magnitude). Likewise, internal floaters achieved a statistically greater number of decelerations than the external and square floaters; and greater DC at 7-13.9, 14-17.9, > 18 km h^{-1}, HR_{mean} and HR_{max} than the zone and square floaters (large to small magnitude). External floaters performed statistically more DC at 7-13.9, 14-17.9, > 18 km h^{-1}, HR_{mean} and RPE than the zone and square floaters (large to small magnitude), more TD, accelerations and decelerations than the square floaters (large and moderate magnitude) and fewer decelerations than the zone floaters (small magnitude). There were also statistical differences between the zone and square floaters, with the zone floaters showing more TD, DC at 7-13.9 and 14-17.9 km·h^{-1}, accelerations and decelerations (large to moderate magnitude).

Table 1. Descriptive data for external and internal load of the floaters in the 4vs4+2

Variable	Internal Floaters	External floaters	Zone Floaters	Square Floaters
TD (m)	1847.4 ± 120.3	1012.8 ± 14.9	960.7 ± 207.6	763.4 ± 93.5
DC 7–13.9 km·h^{-1}	431.5 ± 284.8	275.0 ± 25.0	157.4 ± 108.4	74.4 ± 42.2
DC 14–17.9 km·h^{-1}	65.1 ± 12.5	25.2 ± 15.0	5.9 ± 6.8	1.4 ± 0.35
DC ≥ 18 km·h^{-1}	8.8 ± 6.4	3.4 ± 3.9	0.0 ± 0.0	0.0 ± 0.0
Acc 2.5–4 m·s^{-2}	13.0 ± 3.7	8.0 ± 1.2	8.5 ± 1.7	2.0 ± 1.15
Dec 2.5–4 m·s^{-2}	11.3 ± 4.9	5.1 ± 1.4	8.0 ± 2.1	2.2 ± 1.4
HR_{mean}	147.9 ± 18.6	147.3 ± 17.0	138.6 ± 6.9	136.4 ± 18.6
HR_{max}	180.0 ± 12.4	172.5 ± 17.7	170.0 ± 8.3	170.5 ± 12.0
RPE	6.8 ± 0.3	5.8 ± 0.4	4.8 ± 0.4	4.75 ± 0.4

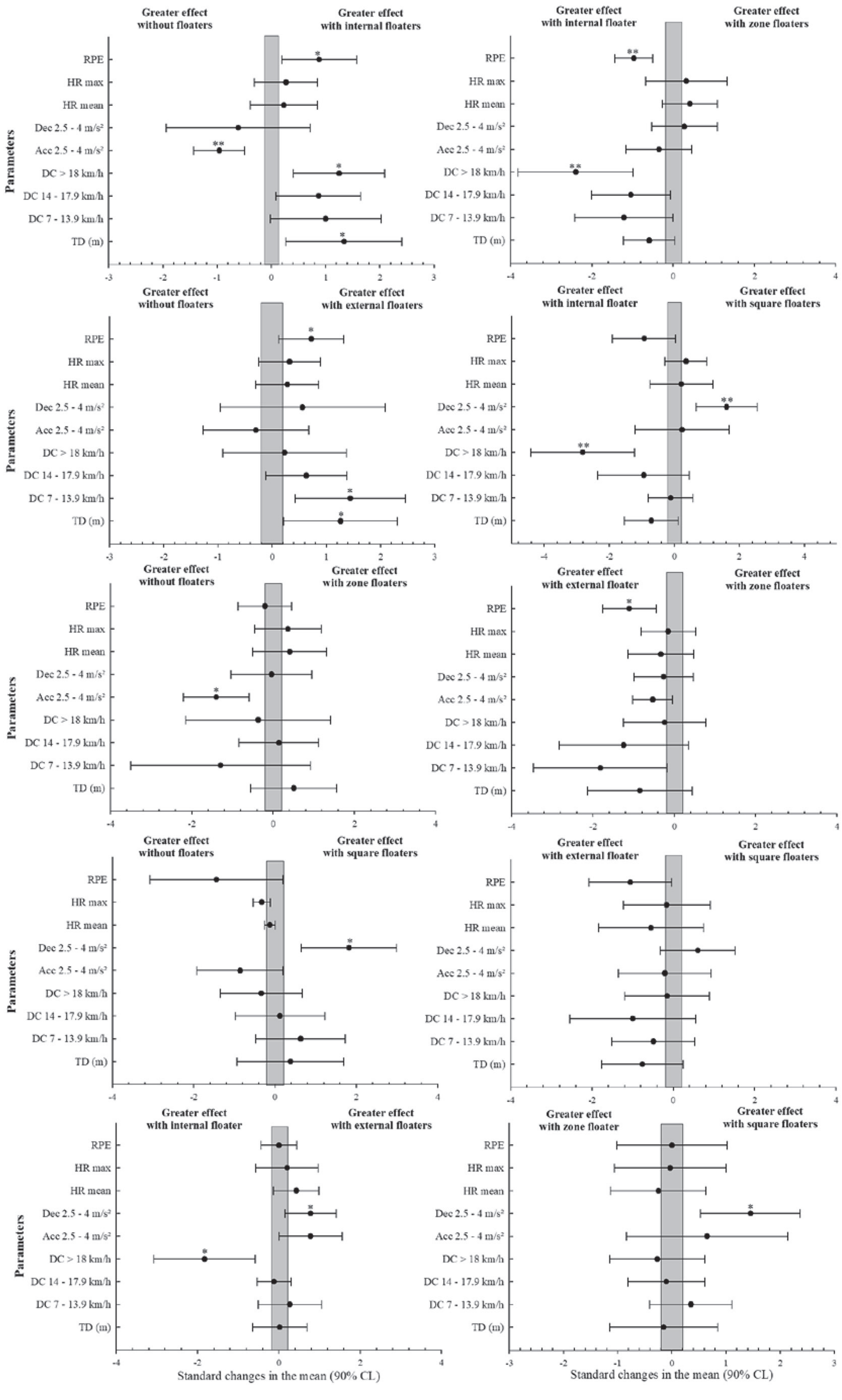


Note. Bars indicate uncertainty in the true mean changes with 90% confidence intervals. Trivial (shaded) areas were calculated from the smallest worthwhile change. TD = Total distance covered; DC = Distance covered; Acc = accelerations; Dec = decelerations; HR = heart rate; RPE = rate of perceived exertion; ES = Effect size; * = p < .05; ** p < .01

Figure 2. Comparison of the external and internal load of floater players depending on their positions in the SSG.

Comparisons between regular players (RP)

Table 2 and Figure 3 present the internal and external load of RPs for the proposed SSGs. With internal floaters, RPs covered statistically more DC at > 18 km·h^{-1} than in any other SSG format (very large and large magnitude). With internal and external floaters, RPs reached statistically greater TD and DC at 14-17.9 km·h^{-1} than without



Note. Bars indicate uncertainty in the true mean changes with 90% confidence intervals. Trivial (shaded) areas were calculated from the smallest worthwhile change. TD = Total distance covered; DC = Distance covered; Acc = accelerations; Dec = decelerations; HR = heart rate; RPE = rate of perceived exertion; ES = Effect size; * = p < .05; ** p < .01

Figure 3. Comparison of external and internal load of RP in different SSGs.

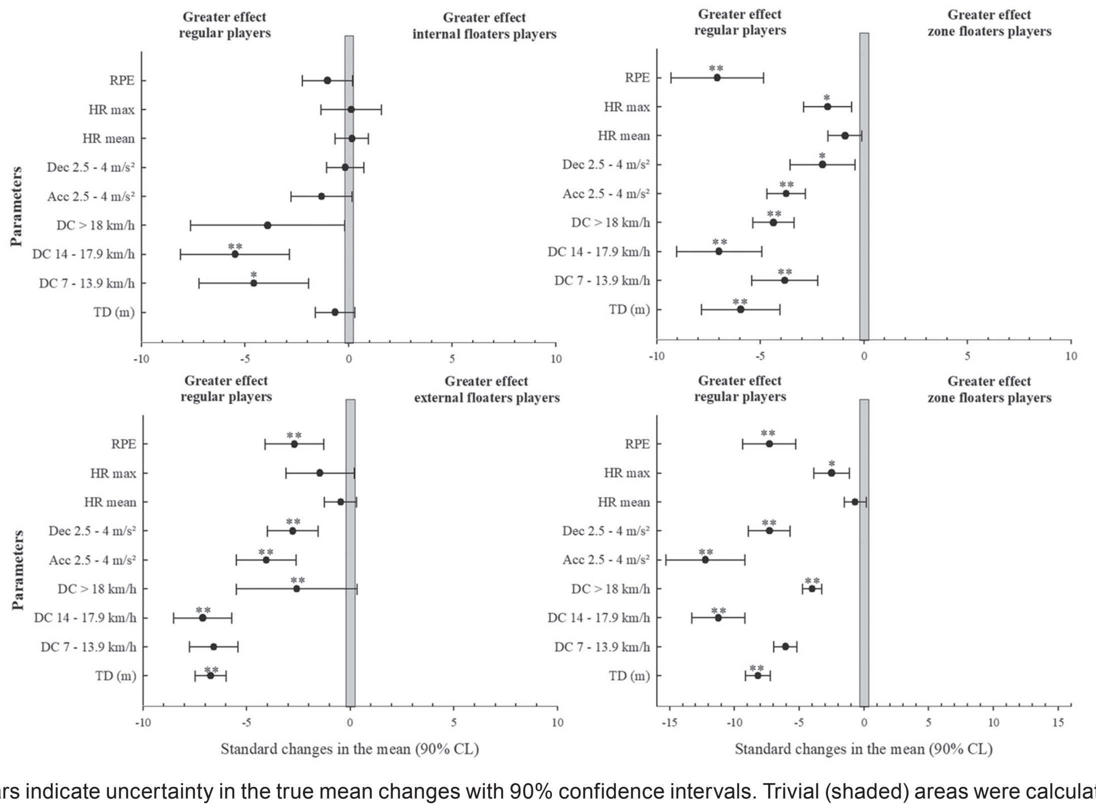
Table 2. Descriptive data for external and internal load of RP in SSGs

	4vs4	4vs4+2			
Variable	Without floaters	Internal Floaters	External floaters	Zone Floaters	Square Floaters
TD (m)	1826.4 ± 107.2	1975.2 ± 169.3	1982.0 ± 135.4	1862.7 ± 191.8	1859.6 ± 155.0
DC 7–13.9 km·h^{-1}	857.3 ± 90.4	943.6 ± 160.3	1005.6 ± 163.0	765.7 ± 306.0	915.6 ± 155.3
DC 14–17.9 km·h^{-1}	213.2 ± 73.6	293.7 ± 90.5	271.7 ± 54.8	219.6 ± 91.0	216.8 ± 70.6
DC ≥ 18 km·h^{-1}	16.2 ± 10.7	46.6 ± 19.6	20.7 ± 16.5	18.1 ± 14.7	16.4 ± 12.2
Acc 2.5–4 m·s^{-2}	21.6 ± 4.4	18.0 ± 3.4	21.3 ± 7.2	16.4 ± 2.6	19.1 ± 5.9
Dec 2.5–4 m·s^{-2}	15.7 ± 3.6	13.3 ± 4.4	19.8 ± 8.4	14.9 ± 3.8	24.0 ± 5.9
HR_{mean}	150.5 ± 44.3	151.2 ± 16.4	159.7 ± 15.6	156.3 ± 17.2	150.8 ± 18.8
HR_{max}	177.4 ± 21.3	181.7 ± 7.3	183.9 ± 7.8	183.0 ± 8.2	181.9 ± 5.2
RPE	7.2 ± 0.6	7.6 ± 0.7	7.6 ± 0.6	6.9 ± 0.3	6.9 ± 0.6

floaters, with the zone and square floaters (large and moderate magnitude) and greater DC at 7-13.9 km·h^{-1} than without floaters or with the zone floaters (large and moderate magnitude). Comparing the changes in velocity, it was found that RPs achieved statistically more decelerations with square floaters than in any other format (large and moderate magnitude). With external floaters and without floaters, RPs performed more accelerations than with the internal zone floaters (large to small magnitude). In the format with internal floaters, RPs performed statistically fewer decelerations than with the external floaters (moderate magnitude). The RPE of RPs when playing with internal and external floaters were statistically higher than in any other format of SSGs (moderate magnitude). RPs did not demonstrate statistical differences in the HR_{mean} and HR_{max} across any evaluated drill.

Comparisons of regular vs. floater players

Figure 4 reports the comparison of external and internal load between RPs and floaters. The analyses indicate that RPs achieved statistically greater TD, DC at 7-13.9, 14-17.9, > 18 km h^{-1}, number



Note. Bars indicate uncertainty in the true mean changes with 90% confidence intervals. Trivial (shaded) areas were calculated from the smallest worthwhile change. * TD = Total distance covered; DC = Distance covered; Acc = accelerations; Dec = decelerations; HR = heart rate; RPE = rate of perceived exertion; ES = Effect size; * = p < .05; ** p < .01

Figure 4. Comparison of the external and internal load in RP and floater players in SSGs.

of accelerations and RPE than floaters in all the SSG formats (very large to moderate magnitude). Regular players also reached a statistically greater number of decelerations and lower HR_{max} than the external, zone and square floaters, and a higher HR_{mean} than the zone and square floaters (very likely to moderate magnitude).

Discussion and conclusions

The main findings of this study were that the external and internal load of RPs and floaters were influenced by floaters' positions during the 4*vs*4+2, showing that (1) the floaters in the internal and external positions exhibited higher external and internal load than those in zone or square positions; (2) although internal and external floaters provoked greater RPE and external load in the RPs than did other floater positions or the absence of floaters, HR_{mean} and HR_{max} did not showed difference in any format; and (3) independently of the floaters' positions, RPs had greater internal and external load than the floaters.

This study has shown that floaters have specific requirements depending on their position in the 4*vs*4+2. Our results revealed that the internal position was the most demanding scenario for floaters. Their freedom of movement throughout the available space could be the cause of this. The square and zone floaters showed lower internal (RPE and HR) and external (DC at 7-13.9, 14-17 and > 18 km·h^{-1}) load than the other positions. Their central position in the game may allow them to focus on adopting a suitable placement and body position to receive and pass the ball during the game, while internal and external floaters have to move constantly to receive the ball. Contrary to previous works (Casamichana & Castellano, 2010; Gaudino, Alberti, & Iaia, 2014; Owen, Wong, Paul, & Dellal, 2014), in this study a smaller relative area per player—zone (100m^2) < internal (120 m^2) < external and square (200 m^2—did not decrease the loads of the players, which could suggest that other aspects such as technical-tactical components of SSGs maybe have a more important influence on the behavior of the players. This information may be of value in the training of post-injury or over-trained players without leaving a specific context since floater training load can be manipulated by modifying their position. Taking this into account, and from a physical and physiological perspective, a suitable progression could be to successively incorporate such a player into 4*vs*4+2 as a floater in: square, zone, external and finally internal area.

This study could also suggest that the internal and external load of RPs are influenced by the position of floaters in 4*vs*4+2 SSG, creating inequalities in the magnitude of the training load and in its nature (TD, accelerations or decelerations). Each floater position can modify the shape of the game and the position of RPs, affecting the demands imposed on them. Although in line with the findings of Casamichana, Bradley, and Castellano (2018), our results contrast with those obtained by Gollin et al. (2016), who found similarities in the running activity of RPs despite modifications in floater positions. These discrepancies could be due to the fact that Gollin et al. (2016) used a format with a relative area of approximately 80m^2 per player, while our study used 120 and 150 m^2 per player, as did Casamichana et al. (2018). This is especially important because it has been affirmed that player loads statistically increase in areas above 100 m^2 per player (Sarmento, et al., 2018), so it could be suggested that floater position is less determinant in soccer drills with small relative areas than in those with larger areas. Further, our data are not in line with previous findings comparing RPs' activity in SSGs with distinct areas and with floaters (Lacome, et al., 2018). This is possibly because that study obtained greater RPs' demands in the format with a larger relative area, and only used SSGs with one floater. In addition, their players were professionals, and the difference in the relative area between their SSGs was approximately half. These circumstances may explain the conflicting results between the studies.

Another relevant aspect that could explain the disparities in the RPs' load in SSGs is that all players change their spatial dispersion, the way they play, and the distances they maintain from their direct opponents when floaters are manipulated in SSGs (Sampaio, et al., 2014). It is known that modifying the length of the pitch increases the load more than modifying its width (Casamichana, et al., 2018). This can also be achieved (without modifying the SSG space) by including internal and external floaters who increase the running activity and internal load of RPs, while with zone and square floaters RPs can prioritize the central region of the game where floaters are placed, allowing them to perform fewer movements to recover the ball. Responses from SSGs played without floaters are as expected, since it has been demonstrated that playing with small unbalanced situations can have a great impact on the demand of RPs (Torres-Ronda, et al., 2015). Despite the importance and the high incidence of floaters in SSGs during soccer training (Hill-Haas, et al., 2010; Lacome, et al., 2018; Rabano-Munoz, et al., 2019), this topic has not received much attention in literature (Ric, et al., 2015), so more research is needed to advance knowledge, and therefore, to be able to compare data with other studies.

Comparing the running activity and physiological demands of RPs and floaters during the SSGs, our results are in line with previous studies showing a greater external load in RPs (Gollin, et al., 2016; Lacome, et al., 2018; Rabano-Munoz, et al., 2019). In relation to the internal load and depending on the floater position, our data are in line with Rabano-Munoz et al. (2019) that showed a greater internal load in RPs than in floaters, and with Lacome et al. (2018) who did not report differences in HR between RPs and floaters. While our variations could be due to the dissimilar load of the floaters, the discrepancies between these studies may be due to different standard levels of players and the probable dissociation between HR and VO_2 during SSGs. We think that the fact that RPs have to participate in both phases of the game (offensive and defensive) created greater demands than those in the floaters, who only focused their activity on the offensive phase of the game. Using players as floaters during 4vs4+2 could be a simple way to decrease the external and internal load for optimal management in specific cases (e.g. during the return-to-play period after injury).

This study has some limitations that mean the data should be interpreted with caution. Only one format (4vs4+2) was used, with a standardized pitch size, so it is difficult to extrapolate these results to SSGs with dissimilar numbers of players or field sizes. In future studies the format and orientation of the floaters should be modified. In addition, this work was carried out with semi-professional players and the size of the sample was small, so it is unclear whether players of other standard levels or a greater sample would display the same behavior. It would therefore be interesting and useful to conduct further comparative studies on the load of floaters and RPs in SSGs, varying the number of players, the pitch area and the level of the players.

This study showed that the incorporation of floaters during 4vs4+2 SSGs influenced the internal and external load of both the RPs and floaters. The floaters placed in the internal and external positions had higher running and physiological demands than those in the zone or square positions and provoked a greater internal and external load in RPs. Finally, RPs had always greater internal and external load than floaters, regardless of the 4vs4+2 format. Considering these conclusions, some practical applications may be offered:

1. Players could be used as floaters during 4vs4+2 to minimize their training load in some special circumstances (e.g., over-trained players or in a return-to-play process), allowing them to train with a lower training load than RPs.
2. Coaches could modify floater positions depending on the magnitude of the training load they want to apply, choosing the internal and external positions to increase it and the zone and square positions to decrease it.
3. Coaches could use floaters in their SSGs to provoke a greater internal and external load during training sessions, depending on players' roles in the team. For example, on the first day post-match starter players could be used as zone floaters to facilitate their active recovery.

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