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LARGE SIDED GAMES AND SPORT-SPECIFIC TRAINING: PARAMETERS OF HIGH INTENSITY IN PROFESSIONAL SOCCER PLAYERS

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Abstract

Study purpose. This study aimed to describe, analyze and compare the high intensity in internal and external load deriving from Large-Sided Games (LSG) exercises during the 4vs4 and 5vs5 formats, with goalkeepers.

Materials and methods. The study participants were 22 professional soccer players (average age: 23.59±4.87 years, weight: 77.8±7.6 kg; height: 183.5±7.5 cm). The 4vs4 + 2 goalkeepers format was performed on a 60×54 m field (324 m^2 per player), while the 5vs5 + 2 goalkeepers format was performed on a 65×60 m field (325 m^2 per player). During the two LSG exercises, the internal load and the external load were analyzed. The LSG exercises were performed in 4 sets of 5 minutes each, with 2 minutes of passive recovery between each set.

Results. The data obtained show that the 4vs4 is the LSG exercise that succeeds in ensuring high exercise intensity: the time spent between 90-100% of the Heart Rate (HR) is significantly higher than in the 5vs5 ($p < 0.005$). The average HR values (percentage and absolute) were also higher and significant ($p < 0.05$) in the 4vs4 LSG.

The peak speed ($p < 0.05$), average metabolic power during exercise phases ($p < 0.05$) and sprint distance ($p < 0.005$) are higher in the 5vs5 LSG.

Conclusions. By modulating the practice time, both formats can be used on the day after the match for those who did not play or on the match-day +3 for the whole team.

Keywords: large-sided games, high intensity, soccer, external load, internal load, professional soccer players.

Introduction

The concept of high intensity activities (HIA) in soccer is still an argued issue. If over the years the concept has been frequently approached to the domain of speed (Di Salvo et al., 2007; Di Salvo et al., 2009; Andrzejewski et al., 2014), quite recently the concept has been increasingly linked to the acceleration domain. In this context, some Authors proposed a different definition of high intensity, closer to the acceleration concept: "any movement that reaches or exceeds the sprint threshold velocity for at least 1 second and any movement with an acceleration that occurs within the highest 5% of accelerations found in the corresponding velocity range" (Dwyer & Gabbett, 2012). Currently the HIA have been seen more and more as a product of the speed by the acceleration, leading to the new concept of Metabolic Power (di Prampero et al., 2005; Osgnach et al., 2010). They suggested a synthesis of all these parameters and proposed an estimate of the internal load. It is known from the literature that the energy cost of running at acceleration is similar to running at constant speed on a slope (Osgnach et al., 2010): in fact, knowing the energy cost of running on a slope at constant speed, it was possible to assume this new parameter [Metabolic Power: MP = Csr (energy cost) × v (speed)]. Applying the concept of Metabolic Power to soccer, 43.1 percent of the actions are in a high-intensity zone, instead of only 6.3 percent as previously reported speed approach (di Prampero et al., 2005; Osgnach et al., 2010).

In a high-intensity intermittent sport such as soccer, the physical demands are complex, encompassing both high endurance capacity and fatigue resistance during high intensity exercise (Fransson et al., 2017; Mohr et al., 2005).

Infact, soccer is a high intensity intermittent exercise that requires a high level of physical fitness for players to successfully perform in the game, and it is characterized

by combining high-intensity activities, such as sprinting, running, accelerating, jumping, and changing direction, with low-intensity phases such as stopping, jogging or walking (Haycraft et al., 2017). The average distance covered by players during a soccer match is between 8 and 12 km (Di Salvo et al., 2010), where they perform between 50 and 250 high-intensity actions (Mohr et al., 2003) that represent about 1-12% of the total distance covered (Krustrup et al., 2005) and perform a run at high intensities (>19.8 km•h^{-1}) every 72s (Bradley et al., 2009). In this sense, during the high- and maximum-intensity phases, the energy that a player gets is obtained through anaerobic processes (both phosphagen and anaerobic metabolism), whereas during the general effort of a soccer match (90 or 120 min), it is obtained aerobically (Krustrup et al., 2006). Therefore, having substrates that provide the necessary energy in each phase seems to be an objective to obtain maximal performance (Thomas et al., 2016).

Elite soccer players perform 587±133 m of high speed running (19.8-25.2 km•h^{-1}) and 184 ± 87 m of sprinting (>25.2 km•h^{-1}) during a typical game (Carling et al., 2016). The total distance of high intensity running depends on the position of the player and team success in a league (Di Salvo et al., 2009). The amount of high-intensity running performed during a game also depends on the competitive standards between leagues: top-class professional soccer player performs more high-intensity running compared with moderate professional soccer players (Mohr et al., 2003). Thus, high level of physical performance is an important factor in determining team success in soccer. Due to the high intensity performance required in soccer, players should perform systematic and scientific physical fitness training. Several studies have shown that high-intensity training improves soccer players' fitness levels and skills, such as sprint, strength, and speed endurance (Kotzamanidis et al., 2005; Thomassen et al., 2010; D'elia et al., 2021; Izzo et al., 2020).

In addition, elevation of high intensity running (24–36%) and sprint distance (50%) over 7 seasons (2006–2013) in English Premier League highlights these factors as important qualities for soccer players (Bush et al., 2015).

Some researchers have suggested that distances covered during high intensity running in matches are valid measures of physical performance in because of their strong relationship with training status (Krustrup et al., 2003; Krustrup, et al., 2005) and are a distinguishing characteristic between different standards of player (Mohr et al., 2003; Bradley et al., 2010; Modric et al., 2022). Recent findings using computerised time–motion analysis of elite-standard Italian League soccer players demonstrated that high-intensity running was reduced towards the end of the game and temporarily after intense periods of the game (Mohr et al., 2003, 2005).

The use of Global Positioning Software (GPS) technology to measure players' training loads has become prevalent in professional soccer. The major focus of GPS use has been to identify the activity profiles of players in training or trial matches (Wehbe et al., 2014). Most studies using GPS in soccer have focussed on movement patterns during match and training activities. However, the relationship between GPS variables and other training load measurements has been explored. Total distance, distances measured at various intensities, and Body Load have been shown to correlate significantly with subjective session-RPE–based training loads (Casamichana et al., 2013; Gomez – Piriz et al., 2011; Scott et al., 2013).

During the weekly microcycles, the technical staff use GPS to quantify specific sport exercises to understand if the physical objectives have been achieved especially in terms of high intensity training.

These specific exercises can simultaneously train both the technical-tactical and the physical aspects. They are better known as Small Sided Games (SSG): in the literature, these exercises have been extensively analysed in order to understand how different formats can influence the internal load (Halouani et al., 2017; Martone et al., 2017; Sanchez-Sanchez et al., 2017; Sannicandro & Cofano, 2017), the external load (Sannicandro et al., 2020; Nevado-Garrosa & Suarez-Arrones, 2015; Gaudino et al., 2014) or both (Arslan et al., 2017; Campos Vazquez et al., 2017; Castellano et al., 2015).

The formats used most often by the technical staff are 4vs4 and 5vs5 because they allow players to train with high intensity; these formats are placed above all in the first post-match training sessions for those players who have been used little during the competition (Goto & King, 2019; Clemente et al., 2019; Póvoas et al., 2018; Gonçalves et al., 2017).

One of the goals of the coaching staff is to monitor and increase the intensity of training. For this reason, ball drills on small spaces (SSG) are replaced by ball drills on large spaces called "Large Sided Games" (LSG).

LSG are these sport-specific exercises carried out with a ball, on fields where each player exploits from 270 to 325 square meters (Sannicandro et al., 2021).

Recently, several studies have emerged that have begun to analyze and understand what happens during these exercises performed on large dimensions (Casamichana et al., 2018; Castagna et al., 2019; Riboli et al., 2020; Cofano et al., 2021).

This study aims to describe, analyse and compare the high intensity in internal and external load deriving from LSG exercises during the 4vs4 and 5vs5 formats, with goalkeepers

Materials and methods

Study participants

22 professional soccer players participated (average age: 23.59±4.87 years, weight: 77.8±7.6 kg; height: 183.5±7.5 cm) including 20 forward players and 2 goalkeepers. The goalkeepers were not considered in the data collection of the external and internal load. The study included the players who had not reported injuries in the previous 60 days and who had played at least two matches in the 4 weeks prior to these LSGs. All footballers knew how to work with GPS monitoring systems and heart rate monitors. The study was carried out respecting the principles contained in the Declaration of Helsinki.

Study organization

For the analysis of the internal load, heart rate (HR) and ratings of perceived exertion (RPE) parameters were

measured. The HR measurement was conducted with a telemetry system and heart rate monitors (Polar Electro Oy, Kempele, Finland) and the analysed values are the average HR and the peak HR in beats per minute (bpm) and as a percentage referred to the maximum HR (% HRmax); in addition to the parameters mentioned above, the time spent (sec) at a HR between 80-90% and between 90-100% was also calculated. For the RPE the CR10 Borg scale was used (Borg, 1982). During the two LSG exercises, the players were monitored using global positioning system (GPS) instrumentation at 18.18 Hz (GPEXE® SYSTEM, EXELIO srl, Udine, Italy) recently validated (Hoppe et al., 2018). The parameters detected and examined are: the distance covered per minute (m), maximum speed (peak in km•h^{-1}), the average metabolic power (W• Kg^{-1}), the average metabolic power (W• Kg^{-1}) during the active phases (MPE avg power), maximum metabolic power (W• Kg^{-1}), the number of accelerations (> 2 m•s^{-2}) and decelerations (<-2 m•s^{-2}) and the maximum acceleration and deceleration (m•s^{-2}). Furthermore the distance covered in different speed has been analyzed: high intensity running (19.90-25.20 km•h^{-1}) and very high speed running > 25.2 km•h^{-1} best know as "sprint" (Di Salvo et al., 2013; Rampinini et al., 2007). Also the distance covered at different intensity pf power has been analysed: high intensity power (20.00 - 35.00 W• Kg^{-1}), very high intensity power (35.00 - 50.00 W• Kg^{-1}) and maximal intensity power that is > 50 W• Kg^{-1} (Osgnach et al., 2010).

The LSG exercises were carried out on a natural grass playing field. The 4vs4 + 2 goalkeepers format were performed on a field 60×54 m (324 m^2 per player) while the 5vs5 + 2 goalkeepers format were performed on a field 65×60 meters (325 m^2 per player).

No. 5 soccer balls were used, positioned both inside the goal and outside the perimeter of the field to speed up the match when the ball ended out. Regular goals (7.32×2.44 m) were used. LSG's exercises were carried out with the encouragement from the technical staff and with the limitation of consecutive touches (3) of the ball. The characteristics of the LSGs are summarized in table 1.

Table 1. The SSG formats used in the study

Variable	4vs4	5vs5
Number of Bouts	4	4
Bout Duration (min)	5	5
Resting Duration (min)	2	2
Pitch Dimension (m × m)	60 × 54	65 × 60
Relative Pitch Size (m^2)	1:324	1:325
Goalkeeper	yes	yes
Specific Rules	Max 3 touches	Max 3 touches
Coach Encouragement	yes	yes

Before starting, players have warmed up for about 15 minutes. The warm-up included an aerobic activation phase, dynamic stretching, conditioning exercises for acceleration and exercises with a ball. After the warm-up, players began with LSG exercises: 4 sets of 5 minutes each, with 2 minutes of passive recovery between each set. During the whole exercise, players were monitored through the use of a heart rate monitor in telemetry and GPS instruments. At the end of each exercise, the RPE value was analysed individually. The two formats were carried out in different days, with a recovery pause of at least 48 hours.

Statistical Analysis

Descriptive statistics (M ± SD) was applied to all observed variables; Student's t-test for paired data was used to verify the existence of statistically significant differences between the average values obtained using the Statistical Package for Social Sciences (SPSS 15.0 for Windows) software. Significance was set at $p<0.05$. Cohen's d was used to verify the effect size index. As for the effect size index (Effect Size), after calculating the δ index it is possible to convert it into Effect Size: ≤ 0.20 small; 0.50 average; ≥ 0.80 large (Cohen, 1992).

Results

A paired t test showed that the different between conditions was significant in the following conditions:

- max speed (km•h^{-1}) 4VS4/ max speed (km•h^{-1}) 5VS5(t=-2,776, df=19, p <.05). The effect size is large (d=-1.27);
- MPE avg power (W• Kg^{-1}) 4VS4/ MPE avg power (W• Kg^{-1}) 5VS5(t=-2,288, df=19, p <.05). The effect size is large (d= -1.04);
- distance (> 25.2 km•h^{-1}) 4VS4/ distance (> 25.2 km•h^{-1}) 5VS5(t=-3,235, df=19, p <.005). The effect size is large (d= -1.48);
- max HR bpm 4VS4/ max HR bpm 5VS5(t=-4,569, df=19, p <.005). The effect size is large (d=2.09);
- max HR % 4VS4/ max HR % 5VS5(t=4,236, df=19, p <.005). The effect size is large (d=1.94);
- avg HR bpm 4VS4/ avg HR % 5VS5(t=2,261, df=19, p <.05). The effect size is large (d=1.03);
- avg HR % 4VS4/ avg HR % 5VS5(t=2,435, df=19, p <.05). The effect size is large (d=1.11);
- time 90-100 4VS4/ time 90-100 5VS5(t=3,698, df=19, p <.005). The effect size is large (d=1.69).

The table 2 shows the results of external load recorded in the 4vs4 and in 5vs5 large sided games.

The table 3 shows the results of internal load recorded in the 4vs4 and in 5vs5 large sided games.

Discussion

The aim of the study is to investigate, analyse and compare high intensity during LSG exercises by monitoring internal and external load parameters during SSG, 4vs4 and 5vs5 exercises.

This study extends the analysis conducted in the literature on LSGs: in fact, this type of exercise manages to come very close to the match demands (Riboli et al., 2021; Cofano et al., 2021; Sannicandro et al., 2021).

The 4vs4 and 5vs5 formats were taken into account as they represent the drills that are most used by the technical staff during the weekly micro-cycle.

The analysis of the internal load data shows that the 4vs4 LSG succeeds in producing both higher and significantly higher peak HR values in percentage and absolute terms per minute than the 5vs5 LSG ($p < .005$).

Table 2. Results of external load recorded in the 4vs4 and in 5vs5 large sided games.

Variable	Mean	Std. Dev	SE. Mean	Paired t test		
				t value	df	Sig.(2-tailed)
Max speed (km•h^{-1}) 4VS4	26.57	.87	.19	-2.77	21	.012*
max speed (km•h^{-1}) 5VS5	27.58	.90	.20			
max acc (m•s^{-2}) 4VS4	4.15	.55	.12	.86	21	.398
max acc (m•s^{-2}) 5VS5	4.03	.24	.05			
max dec (m•s^{-2}) 4VS4	-4.88	.32	.07	1.72	21	.101
max dec (m•s^{-2}) 5VS5	-5.05	.41	.09			
avg met power (W• Kg^{-1}) 4VS4	12.03	.70	.15	-.21	21	.834
avg met power (W• Kg^{-1}) 5VS5	12.11	1.30	.29			
max met power (W• Kg^{-1}) 4VS4	87.98	7.85	1.75	.86	21	.401
max met power (W• Kg^{-1}) 5VS5	84.84	9.38	2.09			
MPE avg power (W• Kg^{-1}) 4VS4	22.30	.49	.11	-2.28	21	.034*
MPE avg power (W• Kg^{-1}) 5VS5	22.63	.87	.19			
distance (19.8-25.2 km•h^{-1}) 4VS4	215.68	49.69	11.11	-1.30	21	.208
distance (19.8-25.2 km•h^{-1}) 5VS5	241.54	73.92	16.52			
distance (> 25.2 km•h^{-1}) 4VS4	15.27	7.99	1.78	-3.23	21	.004***
distance (> 25.2 km•h^{-1}) 5VS5	33.84	20.72	4.63			
distance (20-35 W• Kg^{-1}) 4VS4	629.85	64.31	14.38	.24	21	.812
distance (20-35 W• Kg^{-1}) 5VS5	619.96	144.26	32.25			
distance (35-50 W• Kg^{-1}) 4VS4	223.81	51.91	11.60	-1.61	21	.122
distance (35-50 W• Kg^{-1}) 5VS5	248.96	27.58	6.16			
distance (> 50 W• Kg^{-1}) 4VS4	94.26	24.41	5.45	-1.31	21	.205
distance (> 50 W• Kg^{-1}) 5VS5	108.44	30.98	6.92			
acc events 4VS4	27.75	4.33	.97	.07	21	.940
acc events 5VS5	27.60	5.75	1.28			
dec events 4VS4	33.15	8.45	1.89	.38	21	.704
dec events 5VS5	32.20	4.37	.97			
distance/min 4VS4	146.05	6.71	1.5	-.850	21	.406
distance/min 5VS5	149.34	12.21	2.73			

* p < .05, ** p < .01, *** p < .005

Table 3. Results of internal load recorded in the 4vs4 and in 5vs5 large sided games.

Variable	Mean	Std. Dev	SE. Mean	Paired t test		
				t value	df	Sig.(2-tailed)
RPE 4VS4	7.70	.73	.16	-.34	19	.733
RPE 5VS5	7.80	1.19	.26			
max HR bpm 4VS4	189.65	3.29	.73	4.56	19	.000***
max HR bpm 5VS5	182.50	6.09	1.36			
max HR % 4VS4	95.15	1.69	.37	4.23	19	.000***
max HR % 5VS5	91.75	2.65	.59			
avg HR bpm 4VS4	170.90	7.18	1.60	2.26	19	.036*
avg HR bpm 5VS5	165.00	8.17	1.82			
avg HR % 4VS4	85.85	3.73	.83	2.43	19	.025*
avg HR % 5VS5	82.75	3.65	.81			
time 80-90 4VS4	532.95	273.09	61.06	.36	19	.719
time 80-90 5VS5	498.00	296.82	66.37			
time 90-100 4VS4	257.45	296.66	66.33	3.69	19	.002***
time 90-100 5VS5	9.50	14.60	3.26			

* p < .05, ** p < .01, *** p < .005

These data attest to the fact that 4vs4 is the LSG exercise that succeeds in ensuring high exercise intensity, as football training requires.

Confirming this trend, the analysis shows that the time spent between 90-100% of the FC is significantly higher than in the other format ($p < .005$).

The average HR values in both percentage and absolute terms (beats per minute) were also higher and significant ($p < .05$) when comparing 4vs4 and 5vs5.

The value for the time elapsed between 80-90% of FCmax was greater in 4vs4 although not significant; the RPE values were very similar and therefore not statistically significant, standing at 7.70 ± 0.73 for 4vs4 and 7.80 ± 1.19 for 5vs5.

The analysis of the time spent at HR > 80 %, in both formats, was analysed to understand the effects of the use of LSGs on the parameters of high intensity from a cardiovascular point of view: the 4vs4 format allows high intensity HR to be exerted for 62.89 ± 26.47 % of the total exercise time compared to 42.29 ± 29.17 % for 5vs5.

The external load analysis, on the other hand, does not reveal as much significance as did the internal load analysis.

The parameters found to be statistically different and significant were: peak speed ($p < .05$), average metabolic power during exercise phases ($p < .05$) and sprint distance ($p < .005$), which were greater in the 5vs5 exercise.

On the other hand, observation of the peak values and the number of accelerations and decelerations shows that the two formats impose the same neuromuscular load.

Looking at what has been found with the two formats, the reasons why research interest has shifted in recent years to understanding what occurs with LSGs (Asian-Clemente et al., 2021; Dello Iacono et al., 2022) emerges with greater relevance: in this study, it emerges how the density of 324 m^2/player allows for the structuring of drills that can ensure high-intensity exercise for the footballer.

Comparison with other studies in the literature that have monitored internal load parameters reveals data that are not always in agreement: the %HRmax is higher in the formats observed (in 4vs4: 95.15±1.69% and in 5vs5: 91.75±2.65%) than in the Game profile-training circuit (89.4 ± 2, Dello Iacono et al., 2021) and in another LSG exercise in the literature (86.5 ± 4.5%, Casamichana et al., 2018).

RPE values, on the other hand, are broadly similar compared to the two studies mentioned above.

The participation levels, the aerobic fitness levels of each footballer and the different duration of the exercises may have substantially influenced the internal load data, thus explaining the differences between the studies conducted (Aliberti et al., 2021; Dello Iacono et al., 2021; Zurutuza et al., 2021).

Observation of some high-intensity indicators referring to the external load shows that the distance/minute in both 4vs4 and 5vs5 is slightly lower (4vs4: 146.05±6.71 m/minute, 5vs5: 149.34±12.21 m/minute), than during a sport–specific training circuit (153.1±3.9 m/minute) based on the football performance model (Dello Iacono et al., 2021).

On the contrary, the LSG formats analysed of 4vs4 and 5vs5 manage to ensure a higher distance/minute than exercises carried out in the form of matches in which the values stop at 107.6±14.4 m/minute (Zurutuza et al., 2020), 121.9±2.9 m/minute (Owen et al., 2014) and finally 105.4 ± 10.7 m/minute (Martin-Garcia et al., 2019).

Even when comparing with other studies that have monitored LSGs with the 5vs5 format (Casamichana et al., 2018), the values found in this study are higher for both formats observed.

Analysing the two speed thresholds (19.8-25.2/ > 25.2 $km \bullet h^{-1}$) that attest the distance travelled at high intensity shows that in LSG drills, the values of total metres travelled within the two thresholds are higher than during 10vs10 + GK (Owen et al., 2014) or during official matches (Martin-Garcia et al., 2019); on the other hand, comparisons with other types of sport-specific drills are very difficult, where there has been an attempt to structure a Game profile-training circuit capable of reproducing the same match intensities (Dello Iacono et al., 2021).

The data observed in this study confirm that LSGs are an exercise that effectively stresses the player to meet the demands of match performance (Andrzejewski et al., 2013; Haycraft et al., 2017; Izzo et al., 2020).

In the analysis of the distance travelled at high power (> 20 $W \bullet Kg^{-1}$), it is observed that these values are lower than during the 5vs5 + GK already used in the literature (Goto & King, 2019): however, the different training volume adopted (35 min vs. 20 min) may be the parameter that explains these differences.

The peak velocity (in 4vs4: 26.57±0.87 $km \bullet h^{-1}$, in 5vs5: 27.58±0.90 $km \bullet h^{-1}$) appears to be higher than both other LSG formats that obtained a value of 22.31±2.15 $km \bullet h^{-1}$ (Casamichana et al., 2018) and during a drill that mimics the match where a value of 24.7±0.7 $km \bullet h^{-1}$ is found (Owen et al., 2014).

The peak velocity observed in the two LSGs is very similar to that recorded during official matches (Abbott et al., 2018; Redkva et al., 2018).

A final consideration to be made concerns the comparison of the values obtained in the LSG formats observed in this study with what emerges in the most intense 3,4,5 and 10 minutes recorded during an official competition (Riboli et al., 2021): the values of 4vs4 and 5vs5 are always higher than these indicators observed in competition.

Conclusions

In conclusion, the data from this study can be transferred to field practice.

In organising training, the data from this study can support the choices of the staff. Indeed, LSGs, both in the 4vs4 and 5vs5 formats, seem to reproduce more reliably what emerges in the performance profile of the competition (Riboli et al., 2021).

By modulating the exercise times (even with volumes of more than 20 minutes), both formats can be used to train players who have partially taken part in the match on the day after the match; they can also be particularly useful in the match-day +3 in which the entire team is involved at the same time with sport-specific and general exercises that aim to reproduce match intensities.

Conflict of interest

The authors declare no conflict of interest

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ІГРИ ВЕЛИКИМИ НЕПОВНИМИ СКЛАДАМИ ТА СПЕЦІАЛЬНІ СПОРТИВНІ ТРЕНУВАННЯ: ПАРАМЕТРИ ВИСОКОЇ ІНТЕНСИВНОСТІ В ПРОФЕСІЙНИХ ФУТБОЛІСТІВ

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Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 6 с., 1 табл., 8 рис., 38 джерел.

Мета дослідження. Метою цього дослідження було описати, проаналізувати та порівняти високу інтенсивність внутрішнього та зовнішнього навантаження, що випливає з виконання вправ з ігор великими неповними складами (LSG) під час виконання вправ у форматах 4 на 4 та 5 на 5 з воротарями.

Матеріали та методи. Учасниками дослідження стали 22 професійних футболісти (середній вік: 23,59±4,87 року, вага: 77,8±7,6 кг; зріст: 183,5±7,5 см). Вправу у форматі 4 на 4 + 2 воротарі виконували на полі розміром 60×54 м (324 м^2 на гравця), а вправу у форматі 5 на 5 + 2 воротарі – на полі розміром 65×60 м (325 м^2 на гравця). Під час виконання цих

двох вправ LSG проводили аналіз внутрішнього та зовнішнього навантаження. Вправи LSG виконували в 4 підходи по 5 хвилин кожен, з 2 хвилинами пасивного відпочинку між кожним підходом.

Результати. Одержані дані свідчать про те, що формат 4 на 4 – це вправа LSG, яка успішно забезпечує високу інтенсивність вправи: час, витрачений на 90-100% частоти серцевих скорочень (ЧСС), статистично значуще вищий, ніж у форматі 5 на 5 ($p < 0,005$). Середні значення ЧСС (у відсотках та абсолютні) також були вищими та статистично значущими ($p < 0,05$) у форматі виконання вправи LSG 4 на 4.

Пікова швидкість ($p < 0,05$), середня метаболічна потужність під час виконання фаз вправ ($p < 0,05$) і дистанція спринту ($p < 0,005$) є вищими у форматі виконання вправи LSG 5 на 5.

Висновки. Модулюючи час виконання вправ, обидва формати можна використовувати на наступний день після матчу для тих, хто не грав, або через три дні після матчу для всієї команди.

Ключові слова: ігри великими неповними складами, висока інтенсивність, футбол, зовнішнє навантаження, внутрішнє навантаження, професійні футболісти.

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