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INTENSITY OF SOCCER PLAYERS´ TRAINING LOAD IN SMALL-SIDED GAMES WITH VARIOUS CONTENT FOCUS

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Summary. The aim of this research was to make reference to the difference in heart rate values (HR) of soccer players in small-sided games (SSG) with various content focus. We assumed that the aim at the content in small-sided games would significantly affect the HR values of participating soccer players. The research group was comprised of players (n = 6) of the soccer club FK DAC 1904 Dunajská Streda (U15) at the age of 14 ± 0.7 years. The HR values were evaluated on the basis of collected data, which we obtained using sport testers and special software POLAR TEAM[2]. In order to find out the statistical significance of the difference in HR was used the One-Way ANOVA and the Bonferroni post hoc test. The level of statistical significance was set at 5 %. We found out that by the change of the small-sided game´s content focus, the internal reaction of players´ organism to training load was at different level. In the SSG3, with the emphasis on the improvement of individual´s final offensive game activity – shooting, was recorded the highest achieved HR_{avg} value of the monitored players (181.83 ± 7.11 beats.min^{-1}). This form of the SSG was the most intense. However, there were no significant differences in HR values among the individual forms of the SSG. Our recommendation is to employ in the systematic training process small forms of small-sided games with various content focus, because by the means of it we can adequately prepare the players for the match load itself.

Key words: soccer, training load, heart rate, small-sided games

Introduction

The constant development of contemporary soccer is also influenced by the quality of the systematic, long-term and purposeful training process. Increasing the level of the training process brings about important questions for coaches, including the optimization and intensification of soccer players´ training load. In the training process of soccer players have an inevitable role the small-sided games with different parameters. By small-sided games, it is possible to raise the level of skill potential, tactical management, fitness capacity and emotional intelligence of players. During the small-sided games have to the players solve various complicated, complex game situations under time-space deficiency and under active pressure of opponent. The conditions in the small-sided games are closely related to the match conditions.

A systematic training process helps to increase the adaptation capacity of player´s organism to the load, with which are players confronted in the game itself, or more precisely in the match (Holienka 2004). The training process is oriented on the creation of a specific adaptation change in the player´s organism, which is induced by repeated adaptation stimuli (Holienka 2012). When the dosing of training stimuli is thought-out and systematic and contributes to the development, progressive increasing, stabilization and preservation of the training experience state, then we talk about training load (Kačáni 2005).

Holienka (2012) states that indicators of internal load, including the heart rate (HR), make it possible to determine the useful and effective level of training load. Measuring devices of heart rate can record HR values with high accuracy and reliability. These devices provide accurate feedback on actual reactions of the internal state of players´ organism to the training load. The HR is a widely accepted and frequently used physiological indicator of the players´ physical activity in the training process (Holienka 2016). During last years has the monitoring of HR become an inseparable part of the training load research in collective sports and many authors dealt with this issue in their research (Križan 2011; Teplan et al. 2012a, 2012b, 2013; Aktas et al. 2014; Halouani et al. 2014a, 2014b; Randers et al. 2014; Bujnovský et al. 2015; Gonzáles-Rodenas et al. 2015; Hůlka et al. 2015; Köklü et al. 2015; Torres-Ronda et al. 2015; Asci 2016; Campos-Vázquez et al. 2016; Clemente & Nikolaidis 2016; Giovannelli 2016; Holienka 2016; Hůlka et al. 2016; Owen 2016; Sannicandro et al. 2016; Semjon et al. 2016; Brandes et al. 2017; Clemente et al. 2017; González-Villora et al. 2017; Halouani et al. 2017; Proietti et al. 2017; Rojas-Valverde et al. 2017; Sannicandro & Cofano 2017a, 2017b; Sánchez-Sánchez et al. 2017; Babic & Holienka 2018; Babic et al. 2018; Giménez et al. 2018;

Lacome et al. 2018; Malone et al. 2018; Nagy & Holienka 2018; Peráček et al. 2018a, 2018b; Kunzmann & Bujnovský 2019; Nagy & Babic 2019; Obetko et al. 2019). Sport testers give us immediate feedback on the reaction of player´s organism to the load (Benson a Connolly 2012). Monitoring of HR values is to a large extent implemented in soccer training, which include various forms of small-sided games. It is also used in youth soccer to gain and understand the physiological parameters of soccer trainings and matches load (Owen 2016).

Holienka (1998) claims that the principle – all with the ball - which is currently required in training activities of soccer players, fulfils the game training (GT). The dominant position in it have various forms of small-sided games, which include a several game situations that are similar to the real game situations occurring in the match. Training activity of players in sports games should take into consideration the specific, technical, tactical, physiological and psychological demands of individual game performance (Christopher et al. 2016; Zapletalová et al. 2017). Therefore, the SSG have become a favourite part of the soccer training when increasing the level of game preparedness and fitness capacity of players. By applying the principle of "adequate coverage theory", we try to model in the training process through small-sided games such game conditions, which are similar to real match conditions.

Small-sided games with various content focus improve the individual´s game activities and game combinations in the development of youth soccer player´s potential. Small-sided games are widely used also in daily practice in the training process of the lower age categories. By the SSG, the players gain experience in solving unique game situations, which are regularly occurring during the match. When solving various complex game situations during soccer trainings, the participating players are able to improve their technical side of game preparedness, tactical variability, coordination – condition capabilities and they can increase their mental endurance as well. Soccer coaches are able to influence the intensity of the training load in small-sided games if they adequately manipulate the variables, which affect the intensity of small-sided games. Among these variables are for example: size of playing field, number of players, coaching, game rules, content focus of the game, goal size, number of goals, presence of goalkeepers, dosing of load interval and rest interval (Aktas et al. 2014; Halouani et al. 2014a, 2014b; Randers et al. 2014; Young & Rogers 2014; Gonzáles-Rodenas et al. 2015; Hůlka et al. 2015; Köklü et al. 2015; Los Arcos et al. 2015; Torres-Ronda et al. 2015; Asci 2016; Holienka 2016; Hůlka et al. 2016; Christopher et al. 2016; Sannicandro et al. 2016; Brandes et al. 2017; Clemente et al. 2017; Eniseler et al. 2017; González-Villora et al. 2017; Halouani et al. 2017; López-Fernandéz et al. 2017;

Praça et al. 2017; Rojas-Valverde et al. 2017; Sannicandro & Cofano 2017a, 2017b; Giménez et al. 2018; Jara et al. 2018; Lacome et al. 2018; Mikulič et al. 2018; Nagy & Holienka 2018; Peráček et al. 2018a, 2018b; Sarmento et al. 2018, Sgro et al. 2018; Nagy & Babic 2019).

Methods

In our research was applied a pedagogical experiment within the scientific field of sports kinanthropology. We monitored the internal load of players´ organism expressed by the HR level in various forms of small-sided games (SSG). The research was comprised of the monitoring of individual selected physiological and functional load indicators in the training process. In our case, these were the HR values of young soccer players in the SSG games with various content focus. The dependent variable was the internal load of players´ organism, expressed by the level of HR, and the independent variable was the content focus of the SSG.

The research group was comprised of players (n = 6) of the soccer club FK DAC 1904 Dunajská Streda (U15) at the age of 14 ± 0.7 years. The monitored players were participants at the highest competition of this age category in Slovakia.

The main method used to obtain the research data was the measuring of heart rate (HR). The maximal heart rate values (HR_{max}) were obtained by using the Hipp´s field test (2007). The measuring of HR_{max} were realized on artificial grass in the MOL sports facility of Academy in Dunajská Streda.

Course of the testing HR_{max}

During the testing had to the tested participants run 50 metres in a defined area, which they overcame with various intensity. The test included 6 repetitions in every single set of run. The players went through 4 sets and in each one of them was the intensity gradually increased to the maximal subjective intensity.

The test included - field width run (50 m):

- low-intensity run (warm-up run) – 6 times (120 – 130 BPM),
- medium intensity run – 6 times (130 – 150 BPM),
- submaximal intensity run – 6 times (150 – 170 BPM),
- maximal (subjective) intensity run – once.

There was a 30 seconds long rest interval between the repetitions and 60 seconds long rest interval between the sets. After determination of the maximal heart rate (HR_{max}), we created 5 intensity load zones according to the level of difficulty, which were defined by the percentages of the HR_{max} values.

Table 1

Intensity load zones according to the HR values (Moravec et al. 2007)

ZONE	% HR_{max}	Character
Zone 1	50 – 59 %	Very low intensity
Zone 2	60 – 69 %	Low intensity
Zone 3	70 – 79 %	Medium intensity
Zone 4	80 – 89 %	Submaximal intensity
Zone 5	90 – 100 %	Maximal intensity

To measure the HR was used the sports test device POLAR TEAM PRO. The calculation of the percentage and time representation of HR values in individual zones of load intensity and determination of various HR values, % of HR_{max} and time spent above the anaerobic threshold (ANT) was done by using special software POLAR TEAM^2.

Small-sided games

Before the realization of the SSG were the players divided into two teams (3:3) according to their performance-related level. The players remained in the selected team during all three variants of the small-sided game. Goalkeepers did not have the sports test devices on themselves, since we did not monitor the level of their HRs. The playing field with the size of 450 m^2, (width = 18 m, length = 25 m) was marked out with cones. The small goals had the size of 2 x 1 m, the portable goal had a standard size, the height of 2.44 m and width of 7.32 m.

During the SSG were prepared 9 balls, 6 of them spread around the field, 2 of them were in goals and with one of them was played the game. In this way, we tried to ensure a smooth course of the game and to maintain the intensity of the players´ load. There were a minimum of coaches´ interference in the game with verbal instructions and players could be verbally encouraged with the aim to maintain the intensity of the SSG.

In the course of the SSG were recorded the minimal, average and maximal values of HR, abidance of players in individual intensity load zones and time spent above the ANT. We determined the HR values in three SSG variants, in which the number of players, the size of the playing field and the ratio of load interval to rest interval were the same. In the course of the SSG were changed by intent only the content focus of SSG´s and the way of scoring a goal or points. The load interval lasted 2 minutes, the rest interval was 1 minute (the ratio

of LI to RI was 2:1). The content focus of SSG was aimed at improvement of offensive individual game activity (OIGA) – ball dribbling, passing and shooting.

Table 2

Variants of small-sided games

SSG	Players	GK´s	Field dimensions		Size of field	Dosing of load				
	(n = 6)	(n = 2)	width [m]	lengt h [m]	[m^2]	LI [min.]	RI [min.]	NR	NS	Load [min.]
SSG1	3/3	0/0	18	25	450	2	1	4	1	12
SSG2	3/3	0/0	18	25	450	2	1	4	1	12
SSG3	3/3	1/1	18	25	450	2	1	4	1	12

SSG1 Focus: improvement OIGA – ball dribbling

Game description

Players played the game in a defined area with an unrestricted number of ball contacts. On both sides of the playing field width was created an area (1 m), into which the players had to move and stop the ball. In this way, they scored a point. If the ball got outside the playing field, then the team put the ball into play from the place, where the ball left the playing field.

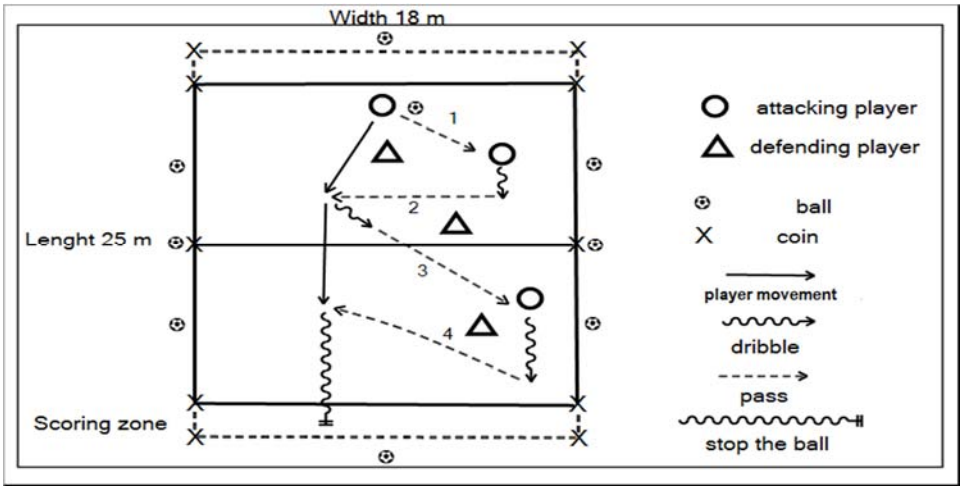


Figure 1

SSG1 – improvement OIGA – ball dribbling

SSG2 Focus: improvement OIGA – passing

Game description

Players played in a defined area with an unrestricted number of ball contacts. They tried to work adequately with the space, to constantly search for the free areas in order to cooperate with their teammates. The players had to make at least 3 passes between each other, and then they could pass the ball into a small goal (2 x 1 m) and thus score a point. If the ball got outside

the playing field, then the team put the ball into play from the place, where the ball left the playing field.

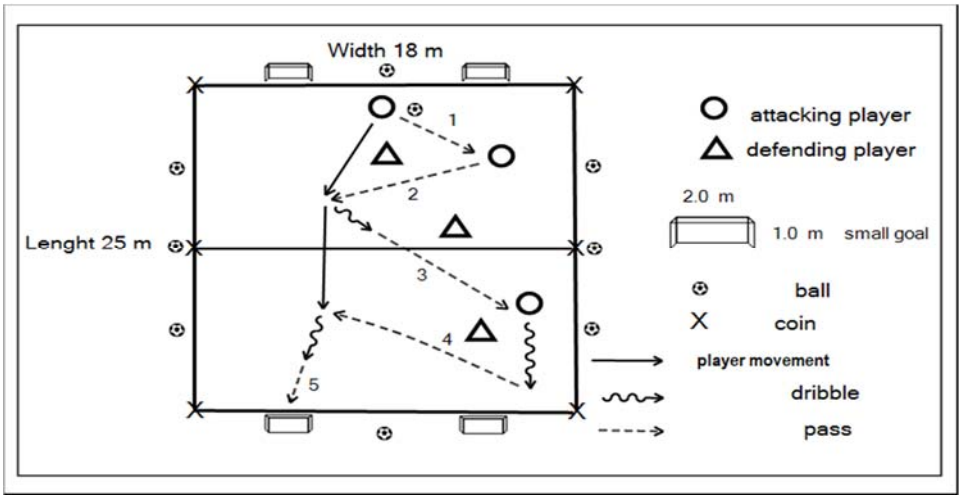


Figure 2
SSG2 – improvement OIGA – passing

SSG3 Focus: improvement OIGA – shooting

Game description:

Players played the game in a defined area with an unrestricted number of ball contacts. They could pass the ball between themselves six times at most, then had to be the offensive phase of the game finished by shooting on the goal. After scoring the goal, the game started from the goalkeeper, whose team received goal.

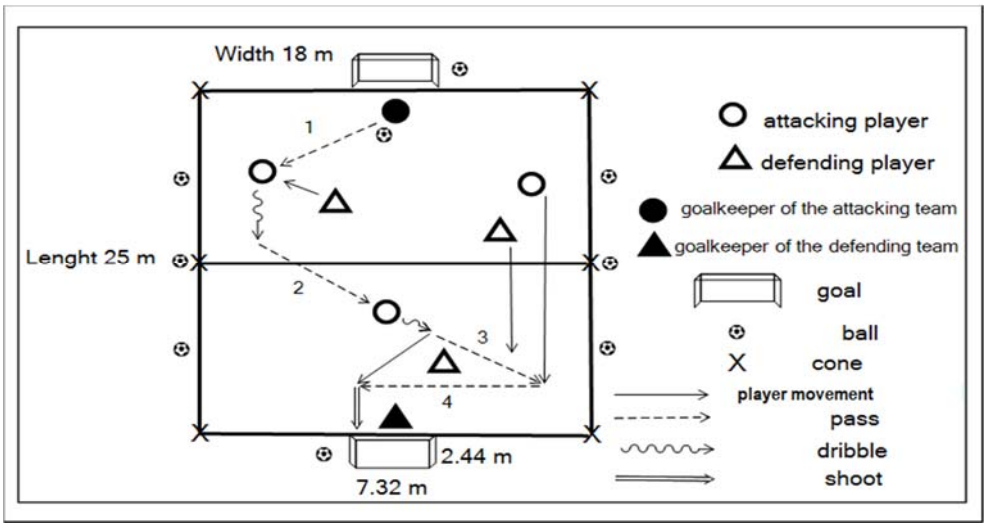


Figure 3
SSG3 improvement OIGA - shooting

Statistical analysis

To determine the statistical significance of the HR were used the One-Way ANOVA method and Bonferroni post hoc test. The level of statistical significance was set at 5% level. The results were interpreted, compared and we tried to find connections between them. Based on these data, we have formulated conclusions and recommendations for training practice.

Results

The main aim in the SSG1 was to improve the offensive individual game activity - ball dribbling.

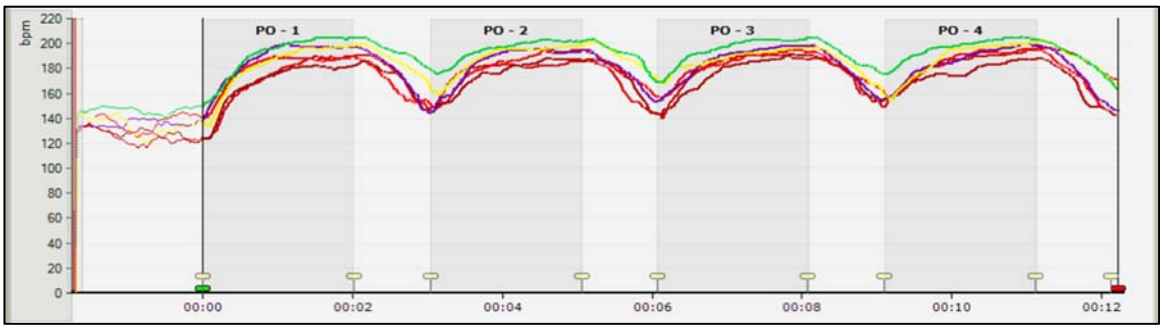


Figure 4

Physiological curves of the monitored players during the SSG1

In above stated Figure 4 are depicted physiological curves of the monitored soccer players during the SSG1. On this physiological curve, we can see a graphic illustration of the soccer players´ load during the SSG1 with four different vertices, which represent four repetitions. The main aim in the SSG2 was to improve the offensive individual game activity – passing.

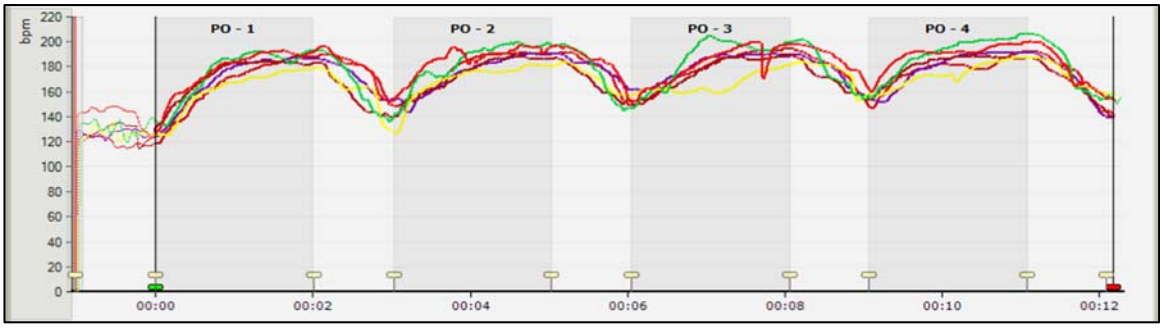


Figure 5

Physiological curves of the monitored players during the SSG2

In above stated Figure 5 are represented physiological curves of the six monitored soccer players during the SSG2. On this physiological curve, we can see a graphic illustration

of the soccer players´ load during the SSG2 with four different vertices representing four repetitions.

The main aim in the SSG3 was to improve the final offensive individual game activity – shooting.

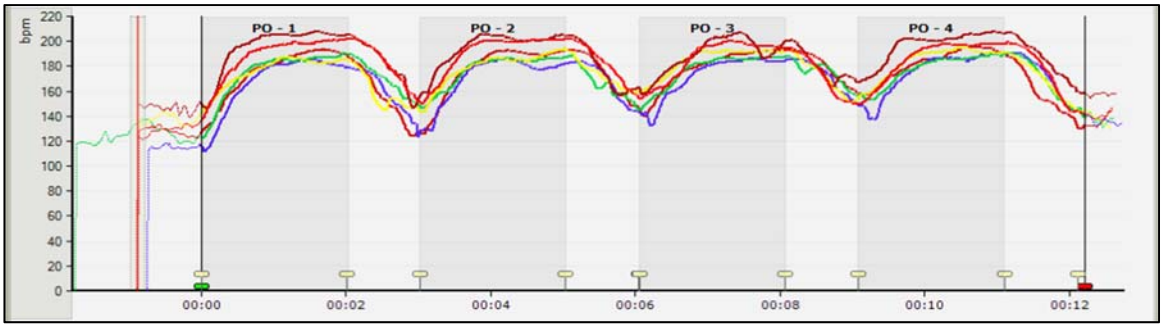


Figure 6

Physiological curves of the monitored players during the SSG3

In above stated Figure 6 are represented physiological curves of the monitored soccer players, which refer to the inequality of the dosing of load and rest interval in four repetitions during the entire SSG3.

The monitored players spent during the individual variants of SSG in selected intensity load zones different time. In table 3 are presented the average time values and the percentage representation of players´ remaining in each load intensity zone.

Table 3

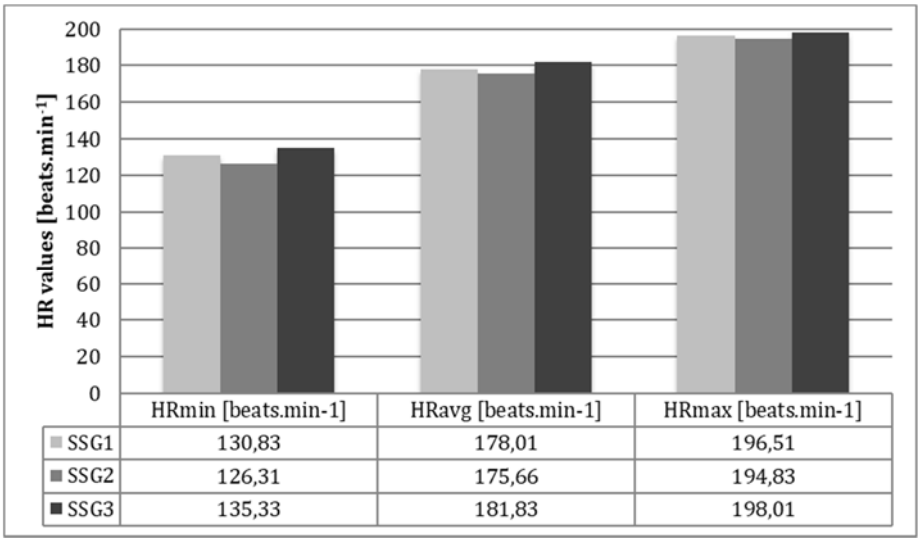
Remaining of players in each load intensity zone

Load zones	**50 – 59 % HR_{max}**		**60 – 69 % HR_{max}**		**70 – 79 % HR_{max}**		**80 – 89 % HR_{max}**		**90 – 100 % HR_{max}**	
Intensity	**Very low**		**Low**		**Medium**		**Submaximal**		**Maximal**	
SSG	**[min]**	**(%)**	**[min]**	**(%)**	**[min]**	**(%)**	**[min]**	**(%)**	**[min]**	**(%)**
SSG1	0.03	0.25	0.32	2.67	1.78	14.83	2.79	23.25	7.08	59.00
SSG2	0.03	0.25	0.30	2.50	2.27	18.92	4.02	33.50	5.38	44.83
SSG3	0	0.00	0.10	0.83	1.32	11.00	3.28	27.34	7.30	60.83

The highest intensity of the training load was monitored in the SSG3, in which the main aim was to improve the final offensive individual game activity – shooting. Players remained in the SSG3 the longest time period in the load zone of maximal intensity (90 – 100 % HR_{max}) on average 7.30 min. (60.83 %) of SSG3 duration and at least in the load intensity zone, which was sufficient to accelerate the regeneration of players (50 – 59 % HR_{max}). In this zone remained the players not even for a second. The lowest intensity was monitored in the SSG2, in which was the content focus of SSG aimed at improvement of a pass. On average spent players

5.38 min. (44.83 %) of the SSG2 duration in the load zone of maximal intensity. In SSG1, with an emphasis on the improvement of the OIGA – dribbling spent the players in the load zone of very low intensity 0.03 min. (0.25 %) of the SSG1´s total time. The average value in the load zone of maximal intensity represented 7.08 min. (59 %). In the SSG2 remained the players the most time in the load zone of submaximal intensity (80 – 89 % HR_{max}), on average 4.02 min (33.50 %).

The internal response of organism in individual forms of SSG games with various content focus was monitored by using the HR values. The recorded values are stated in Figure 7.



	HRmin [beats.min-1]	HRavg [beats.min-1]	HRmax [beats.min-1]
SSG1	130,83	178,01	196,51
SSG2	126,31	175,66	194,83
SSG3	135,33	181,83	198,01

Figure 7
The average HR values in individual SSG forms

The highest average value of minimum HR (HR_{min}) was achieved by the monitored players in the SSG3 with focus on the OIGA improvement – shooting, 135.33 ± 11.01 beats.min^{-1}. The lowest values were monitored in the SSG2, in which the SSG aim was to improve the ball passing, 126.31 ± 5.11 beats.min^{-1}. In the SSG1 with a focus on the ball dribbling was the HR_{min} 130.83 ± 13.48 beats.min^{-1}.

The lowest average HR value (HR_{avg}) of the monitored players was in the SSG2 175.66 ± 5.57 beats.min^{-1} and the highest HR_{avg} in the SSG3 181.83 ± 7.11 beats.min^{-1}. In the SSG1 was the 178.00 ± 7.48 beats.min^{-1}. The recorded average value of maximal HR (HR_{max}) was the lowest in the SSG2 194.83 ± 7.46 beats.min^{-1} and the highest average in SSG3 198.00 ± 5.05 beats.min^{-1}, in the SSG1 was recorded HR_{max} 196.51 ± 7.14 beats.min^{-1}.

In small forms of the SSG, in which the players played in the ratio of 3:3, is the training load often higher than the match load itself. The recorded ascertained values of HR_{max} show that players performed the training activity at a high level.

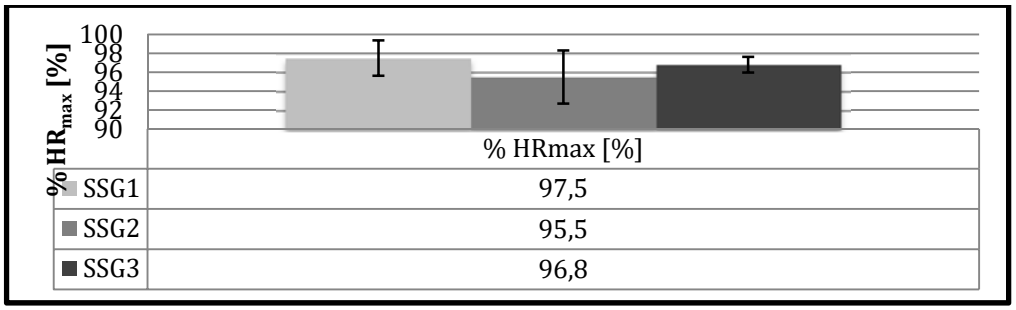


Figure 8

Percentage representation of load achieved from HR_{max}

Differences between the ascertained percentage values from HR_{max} (Fig. 8) are at a low level. We can see that the highest value was in the SSG1 (97.5 %) and the lowest in the SSG2 (95.5 %).

Table 4

Values of HR_{max} % of HR_{max} during the individual SSG variation

SSG	HR_{max}		% HR_{max}	
	[beats.min.$^{-1}$]	SD	(%)	SD
SSG1	196.51	7.14	97.5	1.87
SSG2	194.83	7.46	95.5	2.81
SSG3	198.00	5.05	96.8	0.83

In contemporary soccer is the match load at the level of the anaerobic threshold. During the training process in the individual forms of SSG was the training load at a higher level. Time spent above the ANT represents higher values.

Table 5

Time spent above the ANT

SSG	Time spent above the ANT	
	[min.]	(%)
SSG1	7.62	63.50
SSG2	6.20	51.67
SSG3	8.18	68.17

Players spent the most time above the ANT in the SSG3, it was up to 8.18 min. (68.17 %) of SSG3 duration and at least in the SSG2 6.20 min. (51.67 %) of the SSG´s total time. In the SSG1 the time spent above the ANT 7.62 min., what represents up to 62.35 % of the SSG.

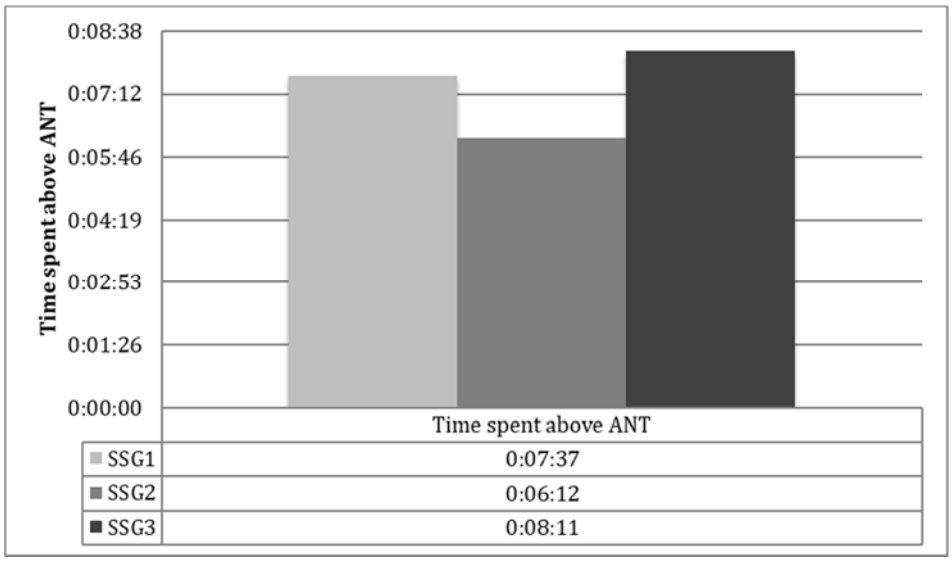


Figure 9
Time spent above the ANT

On the basis of the One-Way ANOVA results, we can state that there is a statistically insignificant difference in HR_{avg} values after completing the SSG with various content focus ($F = 1.2679$, $p = 0.8099$).

The statistical significance between the SSG1 and SSG2 was not proved ($t = 0.5967$, N. S.). The difference between the HR_{avg} was 2.34 beats.min.$^{-1}$. It was probably caused by the fact that the change of SSG´s content focus did not significantly influence the physical and game activity of players, and therefore, the average values of HR were not significantly different. In the SSG1 were not found any statistically significant lower HR_{avg} than in the SSG3 ($t = 0.9802$, N. S.). In the SSG1 it was 178.00 ± 7.48 beats.min.$^{-1}$, in the SSG3 were the recorded HR_{avg} values of 3.83 beats.min.$^{-1}$ more, 181.83 ± 7.11 beats.min.$^{-1}$.

Statistically significant differences in the HR_{avg} values between the SSG2 and SSG3 were not proved ($t = 1.5769$, N. S). The difference between the HR_{avg} values was 6.17 beats.min^{-1}. The content focus of SSG did not significantly affect the internal response of the players´ organism to the load during the SSG.

Discussion

Heart rate (HR) is a generally accepted and often used physiological indicator of the players´ physical activity in the training process (Holienka & Cihová 2016). When speaking about the results obtained from the sports devices, one has to respect the fact that

the HR values showing the training load intensity of the soccer players´ organism in different forms of small-sided games are only indirect indicators.

The SSG in a systematic training process enables the players to improve and stabilize the technical and tactical side of game activities, to secure the development of creative thinking and their actions on playing field. The conditions of SSG ensure the realization of various series of individual´s game activities and combinations, which have a positive effect on spatial orientation, physical activity and players´ emotions as well. The contradictory activity of opponent forces the players to flexible change the individual phases of the game, what means that their game capacity, or more precisely the swift switch from defensive to offensive game phase and vice-versa, is developing. The set training aims and tasks are fulfilled by appropriate changing of the SSG rules and their content focus.

The small-sided games are a complex form of players´ game development, owing to their high level of specificity it is possible to ensure a smooth development of their game performance efficiency (Babic 2016). Claims that the SSG can be described as a complex element in the player´s specific potential development, which can we by laying down our rules, precisely aim at the goal that we want to achieve in training. It is very important to make the SSG rules and content focus clear to all players, who have to agree with the SSG goal. Incorporating of the SSG games into a soccer training is a very effective part of training activity. All age categories are developing their special persistence in them, thereby is their level of training experience on the increase and the players are in a constant contact with the ball. Soccer players are improving their technical side of the individual´s game activities, participating in the course of game actions, trying to anticipate the opponent´s actions and operatively reacting, which means they improve their tactical skills as well. Well-designed small-sided games can direct the players to the goal, which they want to achieve in training, and increase the level of their game preparedness.

Los Arcos et al. (2015) claims that the SSG games are more effective than interval training by maintaining of young soccer players´ aerobic abilities at the end of a competition. Players during the SSG games showed more joy in physical activity than during the interval training. By the SSG it is possible to maintain the level of anaerobic abilities by specific means and to increase the players´ motivation. The SSG games performed on smaller playing fields, in which is involved a lower number of players, are ideal for development and improvement of special match condition and game capacity (Peráček et al. 2018a; Peráček et al. 2018b; Mikulič et al. 2018).

Small forms of SSG games (3:3) with the rule of stopping the ball in a defined area of playing field represent for coaches an alternative to increase the demands on the cardiovascular and metabolic system of young players (Halouani et al. 2017). The HR values in the SSG1, in which the team scored a point after the ball was stopped in a predetermined defined area, were higher than in the SSG2, in which players had to hit a small empty goal.

Castellano et al. (2013) claim that the intensity of the training load was highest in the SSG game with a focus on ball holding. If they played on goals of standard size with goalkeepers, or on small goals, then the HR values were significantly lower. Gonzáles-Rodenas et al. (2015) confirmed in their study, that the SSG games with a focus on ball holding caused the highest internal response of the players´ organism. This can be due to the fact that the players have to constantly work with the space, free themselves of the opponent and adequately make a free space for their teammates. If there were no small goals on the playing field, but only a goal of a standard size, then would have the players more possibilities to deal with game tasks, because they could cooperate with the goalkeeper.

Table 6

Percentage representation of time spent in the maximal intensity load zone in the SSG

Authors	**Brandes et al. (2017)**	**Our research**
Zone	**90 – 100 % SF_{max}**	
SSG-SB/SSG1	36.2 ± 26.1	57.96 ± 5.47
SSG-2G/SSG2	28.3 ± 29.7	44.28 ± 19.42
SSG-1G/SSG3	42.8 ± 25.5	59.85 ± 5.78

In Table 6 is shown that in various forms of the SSG the players spent different periods of time in the load zone of maximal intensity. The most intense was the SSG1 with the aim to improve the shooting. The minimum time was spent in the zone of 90 – 100 % HR_{max} in the SSG2 with the content focus on improvement of the passing. Similar results were presented also by Brandes et al. (2017), in their study had the SSG a longer duration and because of this could be the intensity lower.

In Table 7 is presented the internal response of the players´ organism to the match load according to Mendez-Villaneuva et al. (2013) in the U15 category. The zones of load intensity were divided at the same level as in our research. The intensity of the training load was higher than the match load.

In our research was the LI 2 minutes and the RI lasted only 1 minute. Because of it spent the players more in the load zone of maximal intensity (90 – 100 % HR_{max}).

Table 7

Intensity of U15 players´ match load (Mendez-Villaneuva et al. 2013)

Zones	< 60 % HR_{max}		61 – 70 % HR_{max}		71 – 80 % HR_{max}		81 – 90 % HR_{max}		91 – 100 % HR_{max}	
Match	1st half	2nd half	1st half	2nd half	1st half	2nd half	1st half	2nd half	1st half	2nd half
(%)	0.5 ± 0.5	1.6 ± 1.5	2.0 ± 2.9	6.9 ± 5.6	12.7 ± 7.7	22.3 ± 10.4	38.0 ± 14.3	39.6 ± 10.8	44.9 ± 21.0	25.8 ± 17.1

During the match is the internal response of the organism to the load at different levels. A systematic, purposefully thought-out training process has to stimulate all those energy systems, which predominate in the match. In practice is this criterion replaced with the cognition and adequate manipulation of SSG´s variables, including the aim and content focus of SSG (Peráček 2014).

Halouani et al. (2014a) found out, that players had statistically significant higher HR values (178 ± 3 beats.min.$^{-1}$) in the SSG, in which was the aim to stop the ball in a defined area. When they played the small-sided game on a small empty goal, then the HR values were lower (174 ± 3 beats.min.$^{-1}$). The results of the above stated author are corresponding to ours. The HR_{avg} value in the SSG1 was 178.00 ± 7.48 beats.min.$^{-1}$, in the SSG2 175.66 ± 5.57 beats.min.$^{-1}$. In terms of load intensity is the SSG1 more effective for the development of players´ potential.

In the study of Halouni et al. (2017) is stated that the monitored players had higher HR values in the SSG, in which the players had to stop the ball in a defined area, than in the SSG in which they could score a goal in a small empty goal.

Table 8

Comparison of HR values and % of HR_{max} in various forms of the SSG

	Halouani et al. (2017)	**Our research**
Number of players (n)	3:3	3:3
Playing field [m]	20 x 25	18 x 25
Load interval (min.)	4	2
Rest interval (min.)	2	1
Number of repetitions	4	4
SB-SSG/SSG1	181 ±2.86 beats.min.$^{-1}$	178.00 ±7.48 beats.min.$^{-1}$
SB-SSG/SSG1	87.5 %	97.5 %
SG-SSG/SSG2	176 ±2.73 beats.min.$^{-1}$	175.66 ±5.57 beats.min.$^{-1}$
SG-SSG/SSG2	85 %	95.5 %

In Table 8 we can also see that the SSG, in which the players had to stop the ball in a defined area of playing field, were the HR_{avg} values higher than in the SSG, in which played the players on a small goal. The acquired values of % HR_{max} were also higher in the SSG, in which were the players tasked to stop the ball, than in the case when they had to dribble the ball and subsequently end the offensive phase on the small goal. In our case are the percentage values of HR_{max} at a higher level. We can claim credit for the load dosing. The ratio was the same (1:0.5), but the load interval by Halouani et al. (2017) lasted 4 minutes and in our monitored SSG it was only 2 minutes.

The internal response of the players´ organism was different, when the rules concerning the way how they can score a goal were changed (Halouani et al. 2017). The same was found in our research. The internal response of the organism during the various SSG forms with various content focus was at different levels. The highest values were found out in the SSG3, if there were goalkeepers present and players could score a goal on a goal of a standard size.

Table 9

Comparison of HR values in individual SSG variants

SSG	Brandes et al. (2017)	Our research
	HR_{avg} [beats.min.$^{-1}$]	**HR_{avg} [beats.min.$^{-1}$]**
SSG-SB/SSG1	173 ± 7	178.00 ± 7.48
SSG-2G/SSG2	169 ± 8	175.66 ± 5.57
SSG-1G/SSG3	175 ± 8	181.83 ± 7.11

In Table 9 we can notice that the internal response of the players´ organism to the load in SSG with various content focus is at different levels. Our results are corresponding to the results of Brandes et al. (2017). Also in their study, the lowest values of HR_{avg} were found in the SSG, in which could the teams score a goal on 2 small goals on the playing field and the highest values were monitored in the SSG, in which was the emphasis on the improvement of shooting on one goal.

Švihorík (2005) claims that, when concerning the SSG rules, it is necessary to be mindful of stopping and preventing the frequent intermittence of game continuity. These rules should force the players to play and move constantly.

In the SSG2 the players had to make between themselves at least 3 passes. It was very challenging without adequate physical activity, the ball often got outside the playing field. Although the reserve balls were prepared around the playing field, when the game started again, the players couldn´t keep the HR values at a high level.

Coelho et al. (2016) found that the players spent a statistically significant more time above the ANT level in the first half of the match than in the second half. By using small forms of the SSG games, it is possible for us to prepare the players for the load at such level.

Table 10

Comparison of the HR_{avg} values of the monitored players in competitive matches

Author (year)	HR_{avg} [beats.min^{-1}]	Level	Country
Capranica (2001)	180	U12	Italy
Helgerud et al. (2001)	171	U19	Dennmark
Rodrigues et al. (2007)	166	U17	Brasil
Strøyer et al. (2004)	174	U13	Dennmark
Castagna et al. (2009)	170	U15	Italy

Castagna et al. (2009) found out that the HR_{avg} values during the matches of the U15 age category are higher than 170 beats.min.$^{-1}$. HR_{avg} values in individual forms of SSG with various content focus were higher than 170 beats.min^{-1}. The internal load of players´ organism points out to high physical activity in individual forms of SSG.

The average HR values found in individual forms of SSG are at a similar level to the values recorded in competitive matches at different levels and in various age categories (Capranica 2001; Helgerud et al. 2001; Strøyer et al. 2004; Rodrigues et al. 2007; Castagna et al. 2009).

Conclusions

The use of modern technologies in soccer trainings, such as sport testers, enable the sports experts to find out the internal reaction of the players´ organism to the load and get objective feedback on the adequacy of the training load. Our aim was to point out to the internal response of the players´ organism in the SSG games with various content focus by/widening the knowledge of this not much examined research issue. Coaches have to include into the conspectus of soccer trainings also the SSG, that are closely related to the aim of the soccer training. In our research were monitored the HR values in the SSG, in which the aims of the SSG game were different. On the basis of acquired data, can be stated that in the SSG with various content focus the HR_{avg} values in individual forms of SSG were different, but not significantly. The highest HR values were recorded in the SSG3. Players in this SSG game remained the longest time in the load zone of maximal intensity and spent

the most time above the ANT. That´s why we can claim that the SSG3 was the most intense one. Among these three SSG variants were the lowest HR_{avg} values recorded in the SSG2. It means players spent the minimum of time in the load zone of maximal intensity and above the ANT level as well. In the SSG1 were recorded lower HR values than in the SSG3, but the internal response of the organism was higher than in the SSG2.

The theoretical part of a thoroughgoing soccer coach is also based on a training process, which is prepared in advance and well-considered according to the physiological principles. In soccer trainings have to be observed the principles of the player´s organism adaptation changes to training stimuli. It is important to prepare the players not only in terms of fitness, but to focus on their game preparedness as well. Therefore, the SSG games with various content focus are ideal for the realization of soccer trainings according to the need of the entire team, group of players or individuals.

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