SMALL-SIDED SOCCER GAME (1V1) IN GOALKEEPERS' TRAINING

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Abstract Small-sided soccer games, i.e. 1v1 are often used in training, which results in a composite influence on the player. Training exercises stimulated in the game allow to master many skills, form habits and modify behaviors associated with solving specific situations during a match. The aim of the study was to assess the intensity of exercise during a 1v1 game for goalkeepers. Eight goalkeepers participated in the experiment (body weight 80.63 ±3.50 kg, body height 184.69 ±3.71 cm, BMI 23.64 ±0.74). All goalkeepers played 1v1 games. During the small-sided game players can use all the goalkeeper techniques to score a goal. During all of the matches, heart rate (HR) was recorded using a sport tester, LA was measured in the second minute after the end of each game. There was also collected data determining subjective assessment of the effort made by the players using Borg scale (RPE). The highest average HR and RPE were recorded in the third match, respectively (192.38 ±8.07 b/min; 14.38 ±2.07), while in the first match the examined parameters were on average 186 ±8.85 b/min; 11.38 ±1.51, and in the second 186.00 ±8.09 b/min; 13.50 ±1.85 respectively. The highest LA level was recorded after the second match and equaled 7.71 ±2.07 mmol/l (7.06 ±3.54 after the first match and 7.5 ±1.37 after the third match). The 1v1 game requires the use of similar to the real game actions, as well as the average exercise intensity is also similar to the scoring-opportunity situations and conditions of a match.

Key words small games, goalkeeper, football

Introduction

Football is characterized by a large number of 1v1 situations that require excellent technical and tactical skills and very good motor and mental preparation. Modern motor preparation is developing rapidly, many coaches are introducing new methods and forms of training. Training exercises are developed in the context of ergonomics and their structure is supposed to be similar to match conditions. That is the reason why the correct programming of the training process should be based on the results of physiological and biochemical monitoring during exercise with characteristics of the efforts performed in a match or in a real game. Using 1v1 duels seems to be right in order to train players in a complex way. By introducing this method of training, coaches can improve technical, tactical

skills and mental abilities while controlling physiological parameters (Bangsbo, 1994; Coutts, Rampinini, Marcora, Castanga, Impellizzieri, 2009; Ngo et al., 2012). Owen, Twist, Ford (2004) confirmed that the intensity measured by a heart rate (*HR*) during 1v1 game corresponds to the level of intensity during a championship match. Endeavoring to full customization, not only the physiological indicators should be controlled but also practical assumptions must be adapted. Extensive research has shown that the intensity of exercise attained in small-sided games is dependent on: rules of the game (Sampaio et al. 2007), number of players (Hill-Haas, Couts, Rowsell, Dawson, 2009a; Hill-Haas, Dawson, Coutts, Rowsell, 2009b; Jones, Drust, 2007; Köklü, Asci, Kocak, Alemdaroglu, Dundar, 2011), size of the playing field (Kelly, Drust, 2009) coaches' verbal support (Rampinini et al., 2007), duration (Fanchini et al., 2011), and presence or absence of a goalkeeper (Rampinini et al., 2007; Kalapotharakos et al., 2011). In addition, Coutts et al. (2009) reported that the RPE (*Rate of Perceived Exertion*) is also a good indicator of the intensity of the global effort. It is strongly correlated with physiological markers and mental commitment of the player performing exercise.

Goalkeeper's position in football, as well as in other team sport, is crucial. Goalkeepers' interventions often decide about the result of a match. Goalkeepers need special training because of the differences in technical skills, tactical behaviors, motor requirements and specific psychical load comparing to outfield players. The role of a goalkeeper is not limited to only defending shots, dealing with crosses or 1v1 defending. An effective goalkeeper needs to secure a defending line, participate in a positional play, and, what is very important, initiate counterattacks with fast, far and precise passes to his partners. It is worth mentioning, that playing on a goalkeeper's position demands rapid decision making which is allowed only by an optimal function of the central nervous system. That is why an optimally adapted direct 1v1 duel between two goalkeepers supported by appropriate tactical assumptions, may be an effective and varied training drill. Reduced playing field forces players to perform more actions occurring in a real game on a goalkeeper's position. What is more, it demands rapid decision making under growing fatigue. In addition, such a rivalry increases motivation and improves spatial perception. Another proof, confirming usefulness of this form of training, is brought by the Fanchini et al. (2011) examination in which they claimed the interval method is optimal for developing specific resistance.

The idea of small-sided games grew out of simple games played on the beaches, on streets or in the parks. The match analysis proves that 1v1 situation is an indispensable part of 11v11 game. For many years coaches have been cautiously using this drill. Coaches have been modifying the game decreasing the playing field, decreasing the number of players and changing the rules (Stephen, Hill-Haas, Dawson, Impellizzeri, Coutts, 2011). In recent years the methods of current monitoring have become usable during training which gave the scientific base to appropriate adjustment of training loads.

The aim of the study was to asses of the efforts' intensity examining the heart rate (HR), lactate acid in blood concentration (LA) and the rate of perceived exertion (RPE) in football goalkeepers competing in 1v1 duel characterized by precise rules.

Methods

Participants

Eight amateur football goalkeepers were examined in the study (body weight 80.63 ±3.50 kg, body height 184.69 ±3.71 cm, BMI 23.64 ±0.74). All of them were competitors in the nationwide goalkeepers' tournament organized by Total Goalkeeping Goalkeepers' Academy „Bitwa Bramkarska" in June 2015 in Wroclaw, Poland. All of the investigated were classified to senior category and they expressed willingness to participate in a voluntary experiment.

Procedures

Participants played three 1v1 duels. These duels were the group phase of the tournament. Each game lasted 2 minutes, the players alternately attacked the opponents' goal with any style of striking and throwing the ball from the attacking zone which was limited to 6 meters from the goal (red markers on the Figure 1). The length of the pitch was 22 meters with half-line on 11 meters from the goal (Figure 1). The players had 10 minutes passive resting brakes between the following matches which were set by the tournament's timetable. Before attempting the experiment, HR and LA were measured in every subject. HR_{max} was calculated as HR_{max} = 220-age (Robergs, Landwehr, 2002). HR was registered continuously during all of the duels with POLAR TEAM 2 (*Kempele, Finland*). Lactate acid concentration in capillary blood taken from the fingertip was examined 2 minutes after every duel end. The measure was made with Lactate Scout (*Barleben, Germany*). The subjects assessed their fatigue after every match end using Rate of Perceived Exertion (RPE) with 20-degrees Borg scale (Borg, 1998).
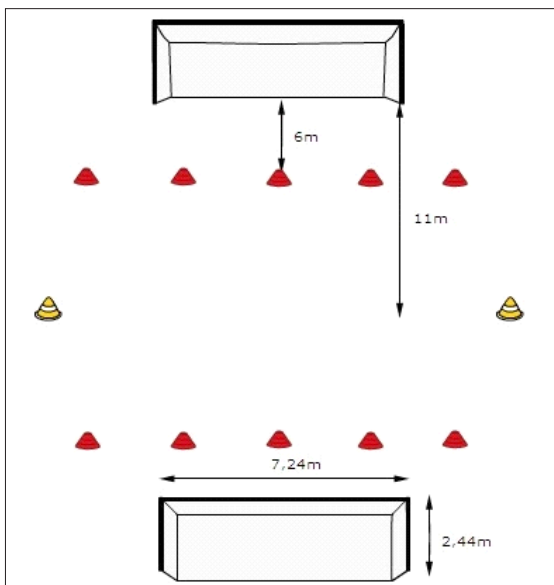

Figure 1. The scheme of the field used for 1v1 matches

Statistical analysis

A statistical analysis was performed in the Statistica12.0 (*Poland*) using basic descriptive statistics and a nonparametric analysis of variance (*ANOVA Friedman*) for repeated measures and post hoc Bonfferoni test. The test of correlation between the examined parameters was performed using the Spearman rank correlation coefficient. The value of $p \leq 0.05$ was set for assessing differences significance.

Results

The data presented in Table 1 shows that the average heart rate, lactate concentration and RPE were at a similar level in all duels, and that the highest average levels of these parameters were recorded in the third match. The LA level was the highest in 2nd match.

Table 1. The values of physiological parameters characterizing the intensity of the goalkeepers' exertion

| Parameter	1v1 duel		
	1st	2nd	3rd
	average	average	average
Heart rate (HR) (b/min)	186.00 ±8.85	186.00 ±8.09	192.38 ±8.07
Percent of Maximum Heart Rate (% HR_{max})	95.09 ±4.58	95.09 ±4.21	98.32 ±3.29
Lactate Accumulation (LA) (mmol/l)	7.06 ±3.54	7.71 ±1.37	7.5 ±2.07
Rating of Perceived Exertion (RPE)	11.38 ±1.51	13.5 ±1.85	14.38 ±2.07

In addition, very strong relationship between HR and RPE (R = 0.75; p = 0.000001); LA and RPE (R = 0.82; p = 0.000001) and between HR and LA (R = 0.73; p = 0.000003) was demonstrated. The intensity of 2 minutes efforts was on extremely high level according to Christensen's scale (Kirschner, 1970). The efforts had exhausting character for the goalkeepers' organisms.
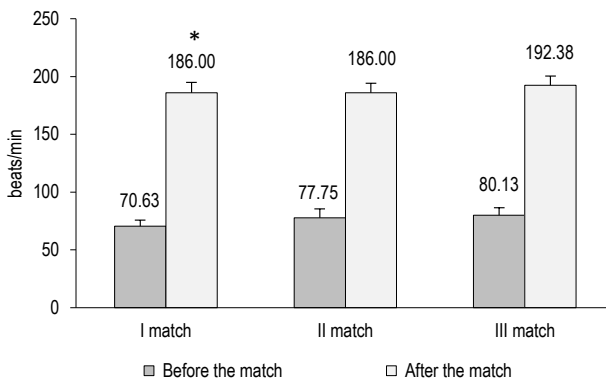
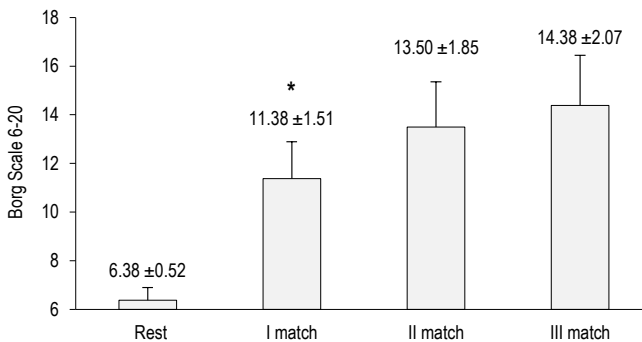* p ≤ 0.05 (rest to 1 match, 2 match, 3 match).

Figure 2. Average HR values in a steady state before starting the exertion and after the end of a duel

The analysis of all measured parameters showed statistically significant differences only between steady state and the values after the first match (HR: 70.63 ±5.26 b/min; 186.00 ±8.85 b/min; Chi^2 = 16.63, p = 0.012; LA: 1.85 ±1.29 mmol/l ; 7.06 ±3.54 mmol/l; Chi^2 = 12.90; p = 0.017; RPE: 6.38 ±0.52; 11.38 ±1.51; Chi^2 = 19.04; p = 0.012) (Figures 2–4). According to the Borg scale, the rate of perceived exertion declared by the goalkeepers was on the light level in the first played duel. The second and third match occurred to be heavy to the goalkeepers' subjective feeling.
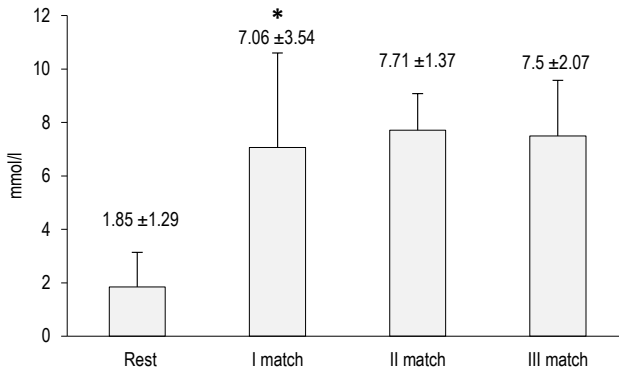
* p ≤ 0.05 (rest to 1 match, 2 match, 3 match).

Figure 3. Average LA values in a steady state before starting the exertion and after the end of a duel

* p ≤ 0.05 (rest to 1 match, 2 match, 3 match).

Figure 4. Average RPE values in a steady state and fater the end of a duel

Discussion

The competition, based on the rules of the small sided game 1v1 for goalkeepers, has been organized anually since 2013 in Poland under the name of Bitwa Bramkarska. The number of competitors increases every year. Both male and female players at ages ranging from 8 to senior age are involved in the tournament. This type of tournaments is gaining bigger and bigger popularity in other countries. The participation of an increasing number of players in this kind of tournaments justifies the need to examine the body response to this specific type of effort, which we have made in our studies. From the standpoint of coaches, it allows to prepare their players to compete through the use of training drills similar in terms of exercise parameters and characteristics of a motor behavior typical of a goalkeeper. Similarly – using this type of training drills requires knowledge about the training load it causes. Our research has shown that a 1v1 game is a heavy load for the organism characterized by high intensity – the average HR above 80% of maximum heart rate and a high level LA (average of 3 matches was 7.42 mmol/L). The high correlation between HR and RPE and between RPE and LA suggests the possibility of using the RPE by trainers as an indirect method of assessing fatigue during this type of effort. The confirmation of the validity of the assessment of the intensity, using the variables we have studied was also shown by other authors (Rampinini et al., 2007).

The analysis of the movements made by the goalkeepers during this specific 1v1 game showed clear differences comparing to the movements observed in typical 1v1 game for the outfield players. In a typical 1v1 SSG, the most time is spent on dribbling, keeping the ball with low speed and running (Owen et al., 2004). The most common way of scoring is shooting the ball with a leg from the surface of the pitch after a feint or after running with the ball. The way of defeating an opponent is dribbling and making faster movements with a ball. However, in 1v1 game for goalkeepers there are several different ways of scoring: shooting a ball after throwing it up (volley), shooting a ball from the surface, throwing a ball to the opponents goal. There are not many feints and they have different character from typical 1v1 SSG for outfield players. Running with a ball is nearly absent, and the distances covered by players are significantly lower which is caused by the limited attacking zone. The wag for defeating the opponent is strong and precise attacking with shots and throws from a distance forced by the rules. In addition – using a real size goals gives some stimulation and motivation to the players and these rules let reduce the random effects (Duarte et al., 2010).

The differences in the motion structure stand as a benefit in goalkeepers training, but they cause a specific fatigue which has not been featured so far in the scientific literature. We believe that this kind of 1v1 game can be an effective training drill for goalkeepers. It is very similar to the real game conditions. The effort has a very similar characteristic – in both situations aero-anaerobic (Owen et.al., 2004; Hill-Haas et al., 2009a). The motion structure is very similar – there are dynamic interventions with and without fall, playing with foot, throwing. What is more, in terms of motivation there can be found similarities – in both cases there is a high contribution of the inner motivation, which source in a real game is a goal to defeat the opponent team, and in this kind of 1v1 game – to defeat a direct opponent. Having in mind the growing popularity and training usability of this kind of 1v1 game for goalkeepers. We believe that further studies examining different age groups, different game-time and playing field's dimensions are needed in order to create detailed description of specific fatigue.

Practical Applications

1. 1v1 game is a very exhausting training drill, which intensity should be controlled in order to precisely fulfill the training program.

2. The intensity in this 1v1 game is near to maximal capabilities of the players and has an anaerobic character.

3. This kind of 1v1 game reflects the actions and effort of real match situations.

4. This kind of 1v1 game can be used to increase the tolerance of fatigue,5. This kind of 1v1 game engages offensive and defensive goalkeepers' techniques with a high motivation.

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