

# TIME MOTION DIFFERENCES BETWEEN ROMANIAN AND POLISH HIGH LEVEL YOUNG SOCCER PLAYERS DURING 6 VS. 6 SMALL SIDED GAMES AS AN EFFECT OF TRAINING PROGRAM

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**Abstract.** The purpose of this study was to present a time motion differences between Romanian and Polish young soccer players during 6 vs 6 small sided games. Young male football players from Schools of Sports Masters in Oradea (Romania) and Łódź (Poland) participated in the study. During the training session the players participated in four small-sided games 6 vs. 6 with goalkeepers (4 × 4 min, 3 min of active recovery). Heart rate responses and distance covered during small-sided games were compared. There were significant differences in the distance covered by both nationality players and age groups in reference to each intensity zone. Polish players covered significantly longer distance compared with romanian soccer players. The results of motion abilities of young players from two countries with different training systems show that training programs can have a significant effect on adoptive abilities of the players.

**Key words:** small-sided games, time-motion analysis, heart rate response

## Introduction

Measurement and assessment of footballers' motion during a training session is a rarely applied procedure. Such practice can be seen only in some professional teams that have a highly specialist measuring equipment. Global Positioning System (GPS) is one of the means that enables to monitor the movements of the player and determine the length of distance covered during the training, his running speed, number of leaps etc. The analysis of these efforts allows for a precise assessment of the training load of each player. It refers especially to the exercise that develop technical and tactical skills for example during the small-sided games.

In recent years, small-sided games have become the most popular training drill for simultaneously improving fitness and technical skills (Hill-Haas et al. 2011). Previous research has shown that small-sided game training may be an effective substitute for developing aerobic and anaerobic fitness (Radziński et al. 2013; Hill-Haas et al. 2009a; Chamari et al. 2005; Koklu 2012). Therefore small-sided games are the crucial training means in the training process in different countries. The efficiency of this training form is dependent on many factors. Previous studies (Hill-Haas et al. 2011; Iaia et al. 2009) have demonstrated that game intensity should be approximately 90–95% of the maximal heart rate (%HRmax). According to Rampinini et al. (2007), factors such as pitch size, the number of players, the rules of the game, and coach encouragement may influence the intensity of small-sided games. However, it is not determined how often small-sided games should be applied in the microcycle (one week) or mezocycle (4 weeks) to improve significantly technical and tactical skills, as well as physical capacity in the players. Jastrzębski et al. (2014) revealed high efficiency of such form of training in groups of young players. Rampinini et al. (2007) reported similar relations among senior football players.

Small-sided games are one of the key training means applied in a specific football training, and combined with other exercise comprehensively prepare the players for the game. The type, volume and intensity together with other training means can decide about the level of fitness and skills of the player. The differences of the applied training load are often caused by choosing different training systems that involve different preferences according to the country in Europe or the world. It is widely assumed that the players from northern and mid Europe show higher conditioning level while players from southern Europe are technically more advanced. This tendency is vivid among the youth groups which are ethnically homogeneous.

The purposes of this study were to present a time motion differences between Romanian and Polish young soccer players during 6 vs 6 small sided games as an effect of training program. It is assumed that the training program applied to both groups of football players could have a significant effect on their motion during small-sided games.

## Methods

### Participants

Young male football players from Schools of Sports Masters in Oradea (Romania) and Łódź (Poland) participated in the study. Both groups showed high sports level in their age group – younger junior (Junior B) and older junior (Junior A) There were 7 national representatives in the Romanian group and 6 in the Polish group. The players from both groups took part in their national competitions during the time of the study. They practiced five times a week on average and played a national league match on Saturday. No significant differences in biometric indexes between both groups were stated (Table 1).

**Table 1.** Characteristics of Romanian and Polish young football players

	Romanian players		Polish players	
	Junior A (n = 10)	Junior B (n = 10)	Junior A (n = 8)	Junior B (n = 9)
Age [yrs]	17.9 ±1.03	16.6 ±0.51	17.4±0.52	16.3 ±0.55
Weight [kg]	68.6 ±4.98	64.7 ±4.08	70.2±5.16	65.6 ±5.07
Height [cm]	178.8 ±4.90	177.7 ±5.52	179.9±6.0	178.4 ±5.73

All the subjects passed their pre-season medical examinations and had their actual sportsmen medical cards. The study was approved by the Ethical Committee of the Regional Medical Chamber in Poland.

**Procedures – small-sided games**

Small-sided games were performed on Tuesdays at the end of preparation period. All the games were played on the same type of artificial pitch at the same time of the day and in similar atmospheric conditions (in Romania: wind < 1 m·s<sup>-1</sup>, temperature 15°C, 40% humidity, and atmospheric pressure of 1010 Hpa; in Poland wind <1,5 m·s<sup>-1</sup>, temperature 12°C, 50% humidity, and atmospheric pressure of 995 Hpa). Before the games, the players performed a 10-minute warm up followed by dynamic exercises with balls.

During the training session the players participated in four small-sided games 6 vs. 6. All the games were played with goalkeepers. As in the previous publications (Impellizzeri et al. 2006; McMillan et al. 2005), small-sided games were performed in an interval format (4 × 4, 3 min of active recovery). The pitch sizes were designed intentionally to keep the pitch area per player similar (120 m<sup>2</sup>/player). In the first and third game no modifications or limits regarding rules (e.g., the number of contacts with a ball) were imposed. In the second and fourth game the players were allowed only two contacts with the ball. During each game, the coaches actively motivated the players to increase their effectiveness (Rampinini et al. 2007). When the ball went out of the playing area, assisting coaches near the pitch supported the players with another ball to minimize game breaks. The heart rate responses during the small-sided games were recorded in 5-s intervals using telemetry devices (Polar Team Sport System; Polar Electro OY, Kempele, Finland).

The physical demands and the distance covered during small-sided games of Romanian and Polish football players measured.

**Time-Motion Characteristics**

The distance covered within small-sided games was measured using previously validated (Castellano et al. 2011; Varley et al. 2012) portable GPS devices (Minimax X version 4.0, Catapult Innovations, Melbourne, Australia) with a frequency of 10 Hz were and analyzed using specialized software (Catapult Sprint 5.0, Catapult Innovations, 2010). During the games, the players wore vests with GPS devices placed on the upper back. As recommended in the instructions, the GPS devices were activated 15 min before starting the training session.

Results of our study were calculated according to speed zones included in studies of Rampinini et al. (2007) (Table 2).

**Table 2.** The division of speed zones

Rampinini et al. (2007) ProZone®	I	II	III	IV	V
	Standing, walking	Jogging	Running	High-speed running	Sprinting
	0–7.2 km·h <sup>-1</sup> 0–2 m·s <sup>-1</sup>	7.2–14.4 km·h <sup>-1</sup> 2–4 m·s <sup>-1</sup>	14.4–19.8 km·h <sup>-1</sup> 4–5.5 m·s <sup>-1</sup>	19.8–25.2 km·h <sup>-1</sup> 5.5–7 m·s <sup>-1</sup>	>25.2 km·h <sup>-1</sup> >7 m·s <sup>-1</sup>

## Training program

**Table 3.** Overview of the weekly training drills during preparation period

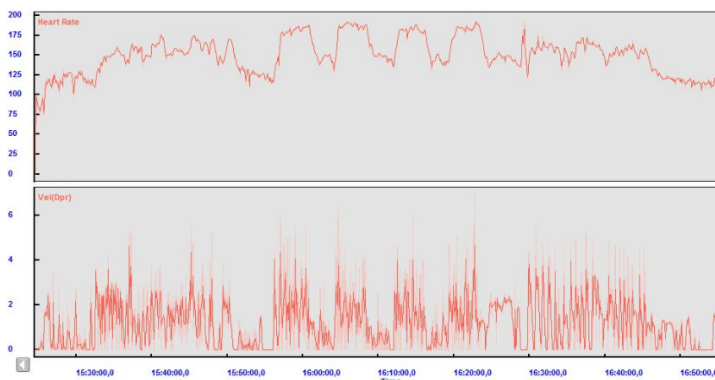
Day of week	Romanian (A) and (B) young soccer players	Polish (A) and (B) young soccer players
Monday	Technical drills	Regeneration/compensation training session
Thursday	Speed and plyometric drills	Small-sided games/interval running
Wednesday	Tactical and coordination drills	Technical, tactical and coordination drills
Thursday	Small-sided games, coordination drills	Small-sided games/interval running
Friday	Tactical drills	Intermittent run (AT-intensity), technical, tactical drills
Saturday	Official match	Official match
Sunday	Free day	Free day

## Statistical analyses

All the results are presented as the mean  $\pm$  SD. All the data sets were assessed using the Shapiro-Wilk test for normal distributions. A t-test for independent variables was used to evaluate the differences between 6 vs. 6 small-sided games. The Wilcoxon signed ranks test was conducted when the normality of the data distribution was disturbed. Levene's test was used to evaluate the homogeneity of the variances. Repeated-measures ANOVA was applied to assess the differences between the bouts. Moreover, ANOVA for independent variables was used to compare the results of different time-motion analyses. All statistical analyses were performed using the Statsoft, Inc. STATISTICA version 9.0 software (Statsoft, Tulsa, OK). The level of significance was set at  $p < 0.05$ .

## Results

Figure 1 shows typical changes of HR and running speed during one training session involving small-sided games in both Romanian and Polish groups of football players, age groups junior A and B. Further analysis of the changes of these indexes revealed no significant differences between both studied groups.



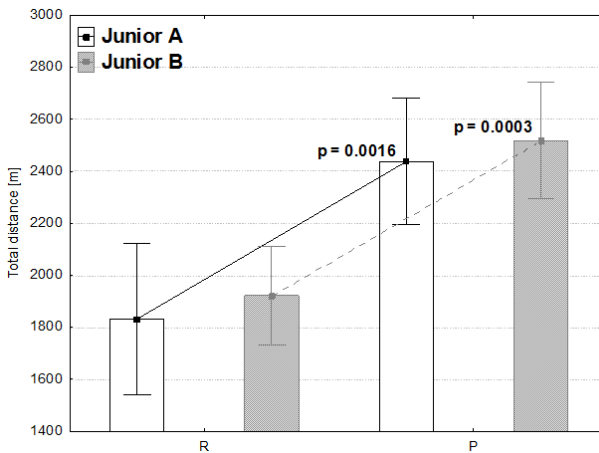
**Figure 1.** Typical Heart Rate and motion level of the young soccer player during training session with the emphasis on four small-sided games 6 vs 6

Table 4 shows statistical significant differences in the distance covered by the players of both nationalities and age groups in reference to each intensity zone. The highest variance was observed in the IV and V zones which are high intensity run and sprints.

**Table 4.** Distance covered [m] in five speed zones by Romanian and Polish players during 6 vs 6 small sided games

Speed zone	Junior A		Junior B	
	Romanian	Polish	Romanian	Polish
I	748.4 ±92.77	590.5 ±108.61*	770.7 ±73.67	584.7 ±107.20*
II	879.8 ±284.26	1282.1 ±269.33*	917.3 ±194.72	1397.3 ±269.83*
III	180.3 ±73.62	441.5 ±85.34*	192.4 ±75.23	391.4 ±93.56*
IV	23.7 ±19.70	114.8 ±52.42*	39.8 ±25.08	125.6 ±31.80*
V	5.8 ±3.82	9.3 ±14.37*	1.6 ±3.41	20.2 ±19.95*

\*Significant difference between nations (R – Romania, P – Poland) at  $p < 0.04$ .



**Figure 2.** Total distance covered by Romanian (R) and Polish (P) young soccer players during small-sided games 6 vs. 6

## Discussion

Typical training program presented in Table 3 was applied within one microcycle during competitive season in groups of Romanian and Polish football players. The main difference was training load. The training of Polish players was more demanding with predominant high intensity efforts while Romanian players were mainly subjected to technical and tactical drills of low or moderate intensity of the work with small-sided games organized once, on Thursday. Their aim was to develop technical and tactical skills with conditioning based on short supramaximal efforts. However, training program of Polish groups (Junior A, Junior B) focused on conditioning. High-intensity small-sided games were applied twice a week (Tuesday and Thursday) and run at AT speed in the initial stage of the training in order to improve specific endurance. These two training programs focused on different intensity could

directly influence the motion results of the players obtained during small-sided games. The other factor that affected the results of total distance covered and significant differences between Romanian and Polish players could be the manner of performance and personal engagement in 6 vs. 6 game. It could result from different realisation of the same training task. Polish players focused on maximal physical engagement during the games while Romanians on technical performance. In our opinion, the revealed differences were the effect of the learned habitual models practiced during the training process. Polish players have been subjected to a similar training program based on small-sided games for two years in different forms which were not stated for Romanian training system.

The analysis and comparison of the motion results obtained during small-sided games in the form of 6 vs. 6 is not simple. It involves a lot of components that coaches often modify when choosing a training scheme. Thus, in the literature available there are no studies that registered total distance covered in a similar manner to ours. The authors who conducted research on the field 151 m<sup>2</sup> per player obtained a similar value for the total distance of 2621m (4 × 6 min) (Hill-Hass et al. 2009b). However, Casamichana et al. (2014) limited the number of games in a series to two (2 × 6 min) for semi-professional football players and stated lower total distance covered during the game with no limited ball touches (1358 m) and with limit of 2 ball touches (1363 m). It might result from the greater area per player (245 m<sup>2</sup>) then in our study.

Another important factor making the comparison of the results harder is various classification of intensity zones of the effort. For instance, Hill-Hass et al. (2009b) or Dellal et al. (2011a) assume running speed higher than 4.72–5 m·s<sup>-1</sup> (17–18 km·h<sup>-1</sup>) as sprint. Other authors suggest speed limit for sprint at 5 m·s<sup>-1</sup> (Dellal et al. 2011b; Abade et al. 2014; Aguiar et al. 2013; Davies et al. 2013; Sampaio et al. 2014; Casamichana et al. 2014). There are some works that make an assumption of 8.33 m·s<sup>-1</sup> (30 km·h<sup>-1</sup>) (Mohr et al. 2003) for sprint or even 10 m·s<sup>-1</sup> (36 km·h<sup>-1</sup>) (Davies et al. 2013). Similarly, discrepancies can be found for standing, walking, run, high intensity run etc.

Methodological inconsistency enables precise comparison of the results as well as training systems that directly affect physical capacity of the players especially in youth groups. Therefore, the solution to the problem can be the system of analysis suggested by Jastrzębski and Radziwiński (2015) regarding motion abilities of the players determined with relation to individual capacity of each player. This method diversifies intensity zones with the use of previously determined sprint limit and running speed at AT (Anaerobic Threshold).

Therefore, results presented in this work can be compared only with each other while data from other studies can be used as approximate source for comparison.

The results of motion abilities of young players from two countries with different training systems show that training programs can have a significant effect on adoptive abilities of the players in terms of physical capacity as well as skills and strategies. Modern training systems of football players of different sports level involve each of these two compounds. Furthermore, analyses similar to these included in this work can be used to develop sports level of the players from various countries, even from those which are culturally diversified and prefer various systems of preparation for football game.

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