A LEVEL OF SPRINT AND JUMP ABILITIES AND INTERMITTENT ENDURANCE OF ELITE YOUNG SOCCER MIDDLEMENERS

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Abstract
The aim of the study was to analyse a level of sprint abilities, jump abilities and intermittent endurance of midfielders from Slovak national under-21 soccer team (n = 7) in time of qualification for the UEFA European Under-21 Football Championship 2011. The level of sprint abilities was diagnosed with the device Fitro Light Gates (FiTRONIC, Bratislava, The Slovak Republic). The criterion for the level assessment was the time obtained in the distance of 10m with the exactness of 0.01s. The level of jump abilities was diagnosed with the device FITRO Jumper (FiTRONIC, Bratislava, The Slovak Republic). The criterion for the level assessment was the jump height in cm with the exactness of 0.1cm. Intermittent endurance was diagnosed with Yo-Yo Intermittent recovery test, level 2. The criterion for the evaluation was total overcame distance in the test in metres (m). Differences in the level of sprint abilities, jump abilities and intermittent endurance were recognised and defined with the special subject analysis. The level of sprint abilities of the whole group was presented with the average performance with the value 2.18±0.10s, the level of jump abilities with the average performance with the value 38.0±3.8cm and the level of intermittent endurance with the average value 1343±352m, what is 63.5±4.8ml.kg⁻¹.min⁻¹.

Key words: sprint, jump, elite young soccer players, midfielder, intermittent endurance

Introduction

The present professional soccer is characterised mainly by dynamics and constant increase in playing speed. We can agree with Nemec, Štefaňák & Sylvester (2005) that explosive power, speed-power movement abilities and intermittent endurance are limiting movement abilities in soccer. The condition according to Bunc (1999) presents 30-40% of playing performance. We agree with the statement of Reilly (1997), Psotta et al. (2006), Orenduff et al. (2010), who say that soccer is intermittent movement activity which contains very short, usually 1 to 5 seconds continuing intervals of endurance with high to maximum intensity, which alternate with intervals of endurance with lower intensity or inaction continuing from 5 to 10 seconds. Little & Williams (2005) include the running acceleration, maximal runnning, speed and agility, which exist usually in the match, into movement activities at high intensity. Bangsbo, Mohr & Krstrup (2006), Bangsbo, Iaia & Krstrup (2007)state by players of the highest level 150 to 250 short intensive activities in a match. Hipp (2007) declares that in the soccer match we can observe by player around 100 to 150 sprints with different length. According to findings of Psotta et al. (2006) is 50-65% of all realized sprintsshorter than 5m, 75-85% of all sprints is no longer than 10m and the average length of sprints is 9m in a single soccer game. Grasgruber & Cacek (2008) state the length of sprints is ca. 15m and usually no more than 30m, every ca. 90s, it means 0.8 to 1 km for the whole match. Jovanovic et al. (2011) declare that number of metres ran at high intensity is criterion for division of players in elite or lower performance level.

Andrzejewski et al. (2012) found out by professional players from European leagues that 90% of all sprints in matches are till 5 seconds.According to researches professional players achieve significantly higher speed in first 10m of sprints in comparison with players of lower leagues (Grasgruber & Cacek, 2008, Psotta et al., 2006). Besides Mohr, Krstrup & Bangsbo (2003) found out by elite players about 28 to 58% bigger distance (p < 0.05)in runs at high intensity (> 19km.h⁻¹)and sprints compared to players of lower level (run at high intensity = 2.43±0.14 vs. 1.90±0.12km, sprint = 0.65±0.06 vs. 0.41± 0.03km). Haugen, Tonnessen & Seiler (2012) discovered that Norwegian national soccer players and players of the Norwegian Premier league achieved higher performance from the point of view of the acceleration and running speed (p < 0.05) than players of 2nd division (difference 1.0-1.4%), 3rd – 5th division (difference 3.0-3.8%), junior national team (difference 1.7-2.2%) and junior players (difference 2.8-3.7%).Considering that this research lasted more years (1995-2010, n = 939, age = 22.1±4.3 years), the authors had the possibility to determine that players in years 2006-2010 were faster about 1-2% in 20m run and had achieved rather maximal speed in comparison with players in years 1995-1999 and 2000-2005. According to Psotta et al. (2006) the active concept of offensive and defensive phase of the game in playing systems is applied more in present soccer. This concept is characterised by involvement of more players in both phases of the game. It means fast switches of groups of players in transition phases from defence to offense and vice versa, movement activity on the large area of the field, which is evident in spatial intersection of players from...
particular groups and horizontal and vertical circulations of players in offensive phase. Bangsbo has already found out in the year 1994 that midfielders make the biggest distance in the match; however the distance in runs at high intensity did not vary by players at different playing positions (Bangsbo, 1994). Rebelo et al. (2012) discovered by elite U19 soccer players that the level of intermittent endurance was significantly higher in comparison with players of the same category from the lower league. Krustrup et al. (2006) and Rostgaard et al. (2008) found out significantly higher (p < 0.05) level of intermittent endurance in Yo-Yo test by elite international soccer players compared to elite soccer players from lower league too. Mentioned studies show the fact that stimulations for development of sprint abilities, jump abilities and intermittent endurance in the training process of soccer players are very necessary. We know that the level of sprint and jump abilities is genetically determined and it depends on neuromuscular coordination and representation of fast muscle fibres but it is necessary to focus on stimulation too.

Methods

The observational group consisted of Slovak national under-21 soccer players (N = 7), playing at the position of midfielders. They were part of a team who fought for qualification in the UEFA European Under-21 Football Championship 2011 in Denmark in the 7th qualification group together with U21 national teams from Croatia, Serbia, Norway and Cyprus. We made this research on October 8th, 2009 in the morning, when we as well as Jančoková (2000) can speak about first daily peak of performance. Diagnostics of the level of sprint abilities, jump abilities and intermittent endurance took place in Národné tréningové centrum (NTC) in Senec before qualification match with the national team of Cyprus for European Under-21 Football Championship on October 14th, 2009 in Achnas. Before diagnostics soccer players went through general warm-up (10 minutes) and speed warm-up (10 minutes). Sprint abilities were measured with the device FITRO Light Gates (FITRONIC, Bratislava, The Slovak Republic) in 10m run from the middle-standing start at the soccer field with natural grass. Examined soccer player posed a starting position on a start line at the beginning of measurement and started to run with the audio signal „Hop” which was at the same time a tripper of measuring in the computer device. Within one measurement the soccer players took two trials. We have chosen a better trial to the evaluation. Jump abilities were measured with the device FITRO Jumper (FITRONIC, Bratislava, The Slovak Republic) consisted of a contact switch mat placed on the floor and connected by means of an USB interface to the computer. Jump abilities were diagnosed with vertical jump from a squat with a countermovement and use of swinging arms (Weineck, 2007).

Examined players posed on the device position of a squat with arms raising forward and gently bent, they made a movement with arms towards rising upward, swished with them and at the same time they made three maximum jumps. Jumping players should make the shortest and strongest take-off, without bending of knees and with relaxed knees. We have chosen the best jump from three jumps to the evaluation. We have used Yo-Yo Intermittent recovery test, level 2 for diagnostics of intermittent endurance (intermittent Yo-Yo test with short recovery – level 2, Krustrup et al. 2006). Examined players ran sections of 40m (2 x 20m). They recovered with relaxed jogging in limited area of 5m behind the starting line, only certain period of time, after every section. The running speed and rest intervals were controlled by audible signals recorded on original CD. The test was finished when examined soccer player did not fulfil time limit for 40m long section two times consecutively. The result of the test was total exceeded distance given in metres (m). In presented study we have used basic statistical descriptive characteristics of performance values, arithmetic average (x), standard deviation (SD), maximum of measured values (max) and minimum of measured values (min). Significance of differences in the level of sprint abilities, jump abilities and intermittent endurance was determined with special subject analysis. The criterion of significance was the value of 1 SD. When it came to difference by evaluation of an individual minimum about one value of SD including the value of SD compared to average performance and the level of the whole group, so we considered it as subject significant difference. The criterion of the level evaluation of sprint abilities was achieved time in 10m distance. In the study we have evaluated the level of sprint abilities in time with exactness of 0.01 s. The criterion of the level evaluation of jump abilities was the jump height in cm with exactness of 0.1 cm. The device FITRO Jumper uses for calculation of the jump height relation \( h = \frac{g x 0.0136 + 45.3}{2} \) according to study of Bangsbo, Iaia & Krustrup (2008).

Results

The evaluation of sprint abilities in the whole group

We have evaluated the level of sprint abilities presented in Table 1 with a special subject analysis. The average level of sprint abilities of the whole group was 2.18±0.10 s. We can say that the player No. 3 has achieved significantly higher level of sprint abilities with the value 2.05 s and the player No. 5 has reached significantly lower level with the value 2.30 s.
Other midfielders have not achieved significantly different level compared to "norm", which means the average performance and the level of sprint abilities of the whole group.

Table 1 The level of sprint abilities of players in the whole group

<table>
<thead>
<tr>
<th>Player</th>
<th>Time in 10m run (s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.09s</td>
</tr>
<tr>
<td>2</td>
<td>2.17s</td>
</tr>
<tr>
<td>3</td>
<td>2.05s</td>
</tr>
<tr>
<td>4</td>
<td>2.11s</td>
</tr>
<tr>
<td>5</td>
<td>2.30s</td>
</tr>
<tr>
<td>6</td>
<td>2.27s</td>
</tr>
<tr>
<td>7</td>
<td>2.26s</td>
</tr>
<tr>
<td>x</td>
<td>2.18s</td>
</tr>
<tr>
<td>SD</td>
<td>0.10s</td>
</tr>
<tr>
<td>max</td>
<td>2.05s</td>
</tr>
<tr>
<td>min</td>
<td>2.30s</td>
</tr>
</tbody>
</table>

* – significant difference of the level of sprint abilities by individual in comparison with the average level of the whole group

The evaluation of jump abilities in the whole group
We have evaluated the level of jump abilities of players presented in Table 2 with a special subject analysis. The level of jump abilities showed in the average performance of the whole group was 38.0±3.8cm. We can say that the player No. 3 has achieved significantly higher level of jump abilities with value 43.6cm in comparison with the average level of the whole group and the player No.1 has reached significantly lower level with value 32.3cm. Other players have not achieved significantly different level compared to "norm", which means the average performance and the level of jump abilities of the whole group.

Table 2 The level of jump abilities of players in the whole group

<table>
<thead>
<tr>
<th>Player</th>
<th>Vertical jump with counter movement of arms (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32.3cm</td>
</tr>
<tr>
<td>2</td>
<td>40.5cm</td>
</tr>
<tr>
<td>3</td>
<td>43.6cm</td>
</tr>
<tr>
<td>4</td>
<td>34.2cm</td>
</tr>
<tr>
<td>5</td>
<td>37.4cm</td>
</tr>
<tr>
<td>6</td>
<td>39.0cm</td>
</tr>
<tr>
<td>7</td>
<td>39.3cm</td>
</tr>
<tr>
<td>x</td>
<td>38.0cm</td>
</tr>
<tr>
<td>SD</td>
<td>3.8cm</td>
</tr>
<tr>
<td>max</td>
<td>43.6cm</td>
</tr>
<tr>
<td>min</td>
<td>32.3cm</td>
</tr>
</tbody>
</table>

* – significant difference of the level of jump abilities by individual in comparison with the average level of the whole group

The evaluation of the level of intermittent endurance of players in the whole group
We have evaluated the level of intermittent endurance of the whole group presented in Table 3 with a special subject analysis. The level of intermittent endurance was indicated with the average performance of the whole group with the value 1343±352m, what is 63.5±4.8ml.kg⁻¹.min⁻¹. We can say that the player No. 2 has achieved significantly lower level of intermittent endurance with the value of its performance 720m, what is 55.0ml.kg⁻¹.min⁻¹ in comparison with the average level of the whole group.

Table 3 The level of intermittent endurance in the whole group

<table>
<thead>
<tr>
<th>Player</th>
<th>Number of ran meters in a test</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1280m</td>
</tr>
<tr>
<td>2</td>
<td>720m</td>
</tr>
<tr>
<td>3</td>
<td>1280m</td>
</tr>
<tr>
<td>4</td>
<td>1240m</td>
</tr>
<tr>
<td>5</td>
<td>1480m</td>
</tr>
<tr>
<td>6</td>
<td>1880m</td>
</tr>
<tr>
<td>7</td>
<td>1520m</td>
</tr>
<tr>
<td>x</td>
<td>1343m</td>
</tr>
<tr>
<td>SD</td>
<td>352m</td>
</tr>
<tr>
<td>max</td>
<td>1880m</td>
</tr>
<tr>
<td>min</td>
<td>720m</td>
</tr>
</tbody>
</table>

* – significant difference of the level of intermittent endurance by individual in comparison with the average level of the whole group

Subjective evaluation of individuals
We have discovered with special subject analysis that the level of sprint abilities and intermittent endurance of the player No. 1 was adequate to the level of the whole group. Although the level of his jump abilities was significantly lower in comparison with the whole group. On the one hand the level of sprint and jump abilities of the player No. 2 was also not significantly different in comparison with the average level of the whole group. On the other hand the level of sprint and jump abilities of the player No. 3 was significantly higher compared to the average level of the whole group. On the other hand the level of intermittent endurance was significantly lower than the average level of the group. We have determined with special subject analysis that the level of sprint and jump abilities of the player No. 3 was significantly higher in comparison with the average level of the whole group. We have determined significantly lower level of sprint abilities of the player No. 5 in comparison with the average level of the whole group. His level of jump abilities and intermittent endurance was not significantly different than the level of the whole group.
The level of intermittent endurance of the player No. 6 was significantly higher compared to the average level of the whole group. The level of sprint and jump abilities was not significantly different than the level of the whole group. We have not found out any significant differences in the level of any tested ability of the player No. 7 compared to the average level of the whole group.

**Discussion**

On the one hand diagnostics of movement abilities can be a decisive indicator of the level of individual, especially limiting movement abilities for coaches and realization teams in soccer. On the other hand an excellent level of movement abilities does not mean automatically transfer into individual playing performance of a player and thereby also playing performance of a team. The insufficient level of movement abilities limits the playing performance of a player at the professional level where details decide the matches. We agree with statements of Reilly, Bangsbo & Franks (2000) that soccer players do not have to dispose with extraordinary performance in any field of physical performance but they have to have appropriate high level in all fields. The authors Bunc & Psotta (2001) mention that physiological presuppositions and norms represent necessary conditions for success at the professional level. Sprint abilities, jump abilities and intermittent endurance in soccer belong to limiting movement presuppositions in achievement of top playing performance at the world level. Intermittent endurance was diagnosed with Yo-Yo Intermittent recovery test, level 2. Bradley et al. (2011) state the correlation (p < 0,05) between results in this test and ran distance at high intensities (r = 0,58) and total ran distance (r = 0,74). By interpretation of determined level of intermittent endurance of young soccer players from our group is necessary to regard the statements from the study of Bangsbo, Iaia & Krustrup (2008) that performance in Yo-Yo intermittent recovery tests grows with the age of young sportsmen. Mály et al. (2011) discovered that Czech national U16 soccer players (N = 23) achieved the level of sprint abilities in time 1.87±0.10s in 10m run on the surface with artificial grass. Cometti et al. (2001) found out that French first league players (n = 29) achieved the average level of sprint abilities in time 1.80±0.06s in 10m run on the surface with natural grass. Dautry, Baudy & Potiron-Josse (2002) discovered that first league players (n = 20, age = 23.5±3.7 years) from French team FC Nantes reached the average performance in 10m run with the value 1.82±0.08s on the surface with natural grass too. Strudwick, Reilly & Doran (2002) determined that players from English team in Premier League (n=19, age=22.0±2.0 y.) achieved the average performance in time 1.75±0.08s. Wisløff et al. (2004) discovered that players from Norwegian elite team Rosenborg FC Trondheim (n=17, age=25.8±2.9 y.) achieved the level of sprint abilities with the value 1.82±0.30s. Measurement was made in indoor shoes on the wooden floor. In our study we have discovered the level of sprint abilities in 10 m with time2.18±0.10s. Determined time is influenced by the fact that players from our group started on audible signal. On the one side the final performance in our test was influenced by reaction speed because it exists in game demands. On the other side it is necessary to mention that majority of stimuli in the game have a visual character. It is necessary to say that the level of running speed is influenced by running technique too. According to Psotta et al. (2006) the structure of player’s movement is influenced by explosive power which becomes evident especially in accelerating phase of a sprint in time ca. 1.85 to 2.00s, when the soccer player runs ca. 10 to 12m. Grasgruber & Cacek (2008) mention too that the power has the biggest meaning for the accelerating phase of a sprint. Wisløff et al. (2004) discovered the significant correlation between performances in a sprint in 10m and vertical jumps (r = 0.72, p < 0.001) of elite international soccer players (n = 17, age = 25.8±2.9 years). Boone et al. (2012) found out that adult players (n = 289) from six teams of the Premier Belgian league achieved the average performance (squat jump (SJ) = 40.7±4.6cm and countermovement jump (CMJ) = 43.1±4.9 cm). Arnason et al. (2004) state that jump height of elite Icelandic soccer players was SJ = 37.8cm and CMJ = 39.4cm. Casajús (2001) discovered that the jump height of Spanish elite team (n = 15) was SJ = 39cm and CMJ with use of arms = 47.8cm. Gissis et al. (2007) compared performance of young players (n = 54) divided into groups of young national team of Greece, high-performance young soccer players and recreational soccer players. Considering vertical jumps there were observed differences (p < 0.05) between national team and other groups. There were not differences by evaluation of vertical jumps between high-performance and recreational young soccer players. Kalapotharakos et al. (2006) compared three teams (n = 19, age = 26±4 years, n = 15, age = 24±4 years, n = 20, age = 23±3 years) of Greek Premier Soccer league considering more anthropometric and condition parameters. They found out that tolerance of lactate, isokinetic power of the knee extensors and performance in vertical jumps showed higher values (p < 0.05) of the team which belonged to three best teams of Premier league compared to values of observed teams which were in the middle and among last teams of the league. Wong & Wong (2009) found out that Asian young players (n = 16, age = 16.2±0.6 years) achieved lower performance in vertical jumps in comparison with European and African players. Given study is evidence that even young soccer players of national team are not the exception and there are significant individual differences from the point of view of the level of tested limiting movement abilities in the group of midfielders. Soccer players who achieve significantly higher and appropriate level of tested movement abilities should keep this level.
Soccer players who reach significantly lower level of tested movement abilities should stimulate movement presuppositions of these movement abilities in the training process and beyond it too. It is necessary to be aware that speed-power abilities are markedly genetically determined and influence of their level is markedly limited. Knowing of anthropometric indicators and the level of movement abilities of individuals made it possible not only to reveal and eliminate found defects in the training process but it allowed us to specify tactical variants against individual opponents together with preparing for qualification matches in European Football Championship. According to demands of modern soccer game there is a difference in playing of outside midfielders and central midfielders. In our study we have chosen young players with the possibility of a change in playing position in the future, so we have not differentiated analysis of the level of tested movement abilities for outside and central midfielders.

We notice together with interpretation of results that if we had defined the determination of subject significance with other criterion as was the value of one decisive divergence, so the results would be interpreted differently. It is also necessary to mention the limits of carried research. The matter of study was sprint abilities running speed in 10m and nonspecific test of jump abilities. Performance in direct sprint and vertical jump in conditions isolated from real game are only certain preconditions because playing performance of a soccer player is influenced by variability of specific game conditions and actual game demands. The specific movement ability becomes evident with changes of frequency, changes in length of step and also changes in running direction because the player is forced to regulate constantly his direct movement on the ground of perception of external conditions. It is cooperation with teammates for example, perception of opponents and realising of running sprint with a ball. As well as by realizing of shooting the player is forced to adjust the sprint technique before shooting. All these reasons can be necessary for creating of specific field tests in the future which will be valid for sprint and jump abilities and will compare with the tests we present in this study. The unrepeated testing is certain limitation too and it is joined with limitation in reliability. The unrepeated measurement can be influenced by external conditions but also by actual internal disposals of examined individual. However we had to adapt to time limiting and organizing possibilities of the schedule of a national U21 soccer team. In spite of mentioned limits the study can be an inspiration for condition and athletic coaches of football teams in order to reveal and eliminate weak aspects of their young players, especially in condition trainings in preparatory seasons and individual trainings according to actual results of diagnostics during entire annual training cycle. Given data can serve as the certain norm or standard of elite young soccer players from the point of view of the level of examined movement abilities. The results of study can be a valuable material for scientists, but for coaches, experts and persons interested in soccer too.

**Conclusion**

The special subject analysis has showed that the level of sprint abilities in this group of midfielders of Slovak under-21 national soccer team was presented with the average value 2.18±0.10s, the level of jump abilities had the average value 38.0±3.8cm and the level of intermittent endurance had the average value 1343±352m, what presents 63.5±4.8mlkg⁻¹min⁻¹. From the individual point of view was the level of sprint abilities and intermittent endurance of the player No. 1 adequate to the level of the whole group. The level of jump abilities was significantly lower in comparison with the level of the whole group. The level of sprint and jump abilities of the player No. 2 was not significantly different compared to the average level of the whole group; the level of intermittent endurance was significantly lower. The level of sprint and jump abilities of the player No. 3 was significantly higher compared to the average level of the whole group and the level of intermittent endurance was not significantly different. The level of sprint and jump abilities and intermittent endurance of the player No. 4 was not significantly different compared to the average level of the whole group. The level of sprint abilities of the player No. 5 was significantly lower in comparison with the average level of the whole group. His level of jump abilities was significantly lower as well as by realizing of shooting the player is forced to adjust the sprint technique before shooting. All these reasons can be necessary for creating of specific field tests in the future which will be valid for sprint and jump abilities and will compare with the tests we present in this study. The unrepeated testing is certain limitation too and it is joined with limitation in reliability. The unrepeated measurement can be influenced by external conditions but also by actual internal disposals of examined individual. However we had to adapt to time limiting and organizing possibilities of the schedule of a national U21 soccer team. In spite of mentioned limits the study can be an inspiration for condition and athletic coaches of football teams in order to reveal and eliminate weak aspects of their young players, especially in condition trainings in preparatory seasons and individual trainings according to actual results of diagnostics during entire annual training cycle. Given data can serve as the certain norm or standard of elite young soccer players from the point of view of the level of examined movement abilities. The results of study can be a valuable material for scientists, but for coaches, experts and persons interested in soccer too.

**References**


journals of sports physiology and performance, 2(1), 111-127.
Belgian soccer players by player position. J of Strength and Conditioning research, 26, 2051-2057.
Bradley, P.S., Mohr, M., Bendiksen, M., Randers, M.B., Flindt, M., Barnes, C., ... & Krstrup, P. (2011).
Sub-maximal and maximal Yo-Yo intermittent endurance test level 2: heart rate response, reproducibility and application to elite soccer. European journal of applied physiology, 111, 969-978.
Cometti, G., Maffiuletti, N.A., Pousson, M., Chatard, J.-C., & Maffulli, N. (2001). Isokinetic strength and
anaerobic power of elite, subelite and amateur French soccer players. International Journal of Sports Medicine, 22, 45-51.
Dauty, M., Bryand, F., & Potiron-Josse. M. (2002). Relation entre la force isocinétique, le saut et le sprint
vrcholového fotbalu. Bratislava: SPN.
končatín k rýchlostným indikátorom bežeckej rýchlosti mladých futbalistov. Česká kinantropologie, 15(3), 157-164.
licencie. Banská Bystrica: SzFZ TMK.
Rostgaard, T., Iaia, F.M., Simonsen, D.S., & Bangsbo, J. (2008). A test to evaluate the physical impact on
Pivovariček, P. et al.: A level of sprint and jump abilities and intermittent endurance... Sport Science 6 (2013) 2: 89-95


RAZINA SPRINTERSKIH I SKAKAČKIH SPOSOBNOSTI I INTERMITENTNE IZDRŽLJIVOSTI MLADIH ELITNIH NOGOMETAŠA SREDINE TERENA

Sažetak
Cilj ove studije bio je analiza razine sposobnosti sprinta, sposobnosti skoka i intermitentne izdržljivosti igrača sredine terena u Slovačkom nacionalnom sastavu do 21 (n=7) u vrijeme kvalifikacija za UEFA Europsko nogometno prvenstvo 2011 za U21. Razina sprinta je dijagnosticirana pomoću uređaja Fitro Light Gates (FiTRONIC, Bratislava, R. Slovačka). Kriterij ostvarene razine bio je postignuto vrijeme u distancama po 10 m s točnošću od 0.01 s. Razina skoka je dijagnosticirana uz pomoć uređaja FITRO jumper (FiTRONIC, Bratislava, R. Slovačka). Kriterij ostvarene razine bila je visina u cm uz točnost od 0.1 cm. Intermitentna izdržljivost dijagnosticirana je pomoću Yo-Yo Intermittent testa oporavka, razine 2. Kriterij za procjenu je bio ukupna ostvarena udaljenost u testu u metrima (m). Razlike u razini sposobnosti sprinta, skoka i intermitentne izdržljivosti prepoznati su s definiranim pomoću posebne "subject" analize ispitanika. Razina sprinta cijele grupe prikazana je s prosječom 2.18±0.10s, razine skoka s prosječkom 38.0±3.8cm i razina intermitentne izdržljivosti s prosječkom od 1343±352m, što je 63.5±4.8ml.kg⁻¹.min⁻¹.

Ključne riječi: sprint, skok, elitni mladi nogometaši, igrač sredine terena, intermitentna izdržljivost

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