

Original Article

A level of jump abilities of elite Slovak soccer players at different positions in field

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Published online: March 25, 2015

(Accepted for publication: March 05, 2015)

DOI:10.7752/jpes.2015.01009;

Abstract:

The aim of the study was to compare a level of jump abilities of elite Slovak soccer players at different playing positions in field (n = 38, age = 23.4±4.9 years, height = 180.1±6.8 cm, weight = 76.8±7.0 kg; defenders = 15, age = 25.4±5.2 years, height = 181.2±5.0 cm, weight = 78.0±6.5 kg; midfielders = 16, age = 21.4±4.0 years, height = 176.8±6.4 cm, weight = 73.1±6.4 kg; forwards = 7, age = 23.4±4.4 years, height = 185.4±7.5 cm, weight = 81.7±7.7 kg). Jump abilities were measured on 2 types of vertical jumps with a device FiTROJumper, (FiTRONIC, Bratislava, Slovak Republic): Squat jump (SJ) and Countermovement jump (CMJ). The criterion of level evaluation of jump abilities was the height of jump in cm with accuracy 0.1 cm. The device One-way analysis of variance (ANOVA) was used for determination of difference significance ($\alpha = 0.05$) between playing positions. The statistical analysis was realized by software IBM® SPSS® Statistics V19. Performance by defenders was observed with these values (SJ = 36.3±4.0 cm, CMJ = 37.3±4.4 cm), by midfielders (SJ = 37.1±4.4 cm, CMJ = 37.8±5.9 cm) and by forwards (SJ = 36.7±2.9 cm, CMJ = 37.8±3.6 cm). The statistical analysis did not show any significant differences between playing groups (Squat jump: $F_{(2,35)} = 0.164$, $p > 0.05$, $\eta^2 = 0.01$; Countermovement jump: $F_{(2,35)} = 0.050$, $p > 0.05$, $\eta^2 = 0.003$).

Key words: Defenders, fitness training, jump abilities, forwards, and midfielders.

Introduction

Modern trends of present professional soccer become evident mainly in dynamics and constant increase in playing speed which is especially presented by limiting jump abilities. We agree with the authors Psotta et al. (2006) who state that the biggest changes in soccer in last years were made especially in condition figures which regard to speed-force assumptions in playing performance. The condition according to Bunc (1999) presents 30-40% of playing performance in soccer. According to Reilly (1997), Psotta et al. (2006), Orendurff et al. (2010), 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 lasting from 5 to 10 seconds. Bangsbo, Mohr & Krusturup (2006), Bangsbo, Iaia & Krusturup (2007) state by professional players 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.

Important fact in connection with meaning of jump abilities is the statement of Psotta et al. (2006) that jump ability develops especially in accelerating sprint phase around 1.85 to 2.00 s when soccer player runs ca. 10 to 12 m. Grasgruber & Cacek (2008) state that the power is the most important factor in accelerating sprint phase too. According to Psotta et al. (2006) 50-65% of all realized sprints are shorter than 5m, 75-85% of all sprints are no longer than 10m and the average length of sprints is 9m in a single soccer game. We can agree with authors that the most important element of running speed of soccer players is starting speed and running acceleration. According to various researches professional soccer players achieve significantly higher speed in first 10 m sprints in comparison with players from lower leagues (Grasgruber & Cacek, 2008, Psotta et al., 2006). Besides Mohr, Krusturup & Bangsbo (2003) found out by elite players about 28 to 58% bigger distance ($p < 0.05$) in runs at high intensity ($> 19\text{km}\cdot\text{h}^{-1}$) and sprints compared to players of lower level (run at high intensity = 2.43 ± 0.14 vs. $1.90\pm 0.12\text{km}$, sprint = 0.65 ± 0.06 vs. $0.41\pm 0.03\text{km}$). Haugen et al. (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 from 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.

If we take presented facts and variability of game requirements into account, e. g. constant direction changes in running, personal duels, getting up after falls, different types of kicks, passes and many other things. We can state that soccer players use almost always jump abilities. Soccer game is characterized largely with

different forms of speed and speed-dynamic abilities and success of a soccer match is depending on and determined by their level. Production and absorption of power reveals in final performance (rational and effective solution of physical activity of the player) but reveals as possible cause of player's injury too (Malý et al., 2011). Jump abilities are limiting factors of the soccer player and their high level is one of the most important preconditions of player's success in realization of playing situations. It comes to many encounters of players of different playing positions in the match. The advantage of high level of jump abilities especially determined in vertical jumps and short sprints can be the decisive moment of successful solution of playing situation in favor of offensive and defensive team. In presented article we compare the level of jump abilities of elite Slovak soccer players according to playing positions in field.

Methods

Subject characteristics

The observational group consisted of players ($n = 38$, age = 23.4 ± 4.9 years, height = 180.1 ± 6.8 cm, weight = 76.8 ± 7.0 kg; defenders = 15, age = 25.4 ± 5.2 years, height = 181.2 ± 5.0 cm, weight = 78.0 ± 6.5 kg; midfielders = 16, age = 21.4 ± 4.0 years, height = 176.8 ± 6.4 cm, weight = 73.1 ± 6.4 kg; forwards = 7, age = 23.4 ± 4.4 years, height = 185.4 ± 7.5 cm, weight = 81.7 ± 7.7 kg) from three Slovak elite soccer teams (MŠK Žilina, FK Dukla Banská Bystrica and AS Trenčín). In competition year 2010/2011 the players MŠK Žilina and FK Dukla played the highest Slovak soccer league and AS Trenčín was the leader of the second highest soccer league. This team won this league and promoted to the highest league too.

Measurement organisation

Measurements were realized during February and March 2011 (MŠK Žilina – February 8th 2011, FK Dukla - February 26th 2011 and AS Trenčín – March 23rd 2011) in morning hours when we can speak about the first daily peak of performance in accordance with Jančoková (2000). The measurements of jump abilities took place in training complex Fitaréna in Banská Bystrica in the same standard conditions.

Measurements of jump abilities

Soccer players went through general warm-up (10 minutes) and speed warm-up (10 minutes). We had measured the level of jump abilities with the device FiTRO Jumper (FiTRONIC, Bratislava, Slovak Republic) consisting of a contact mat placed on the floor and connected with interface to the computer. Jump abilities were measured on 2 types of vertical jumps: Squat jump (SJ) a Countermovement jump (CMJ). We have chosen the best jump from three jumps from both types of jumps to the evaluation. The criterion of level evaluation of jump abilities was the height of jump in cm with accuracy 0.1 cm. The device FiTRO Jumper uses the relationship $h = (g \times Tf^2) / 8$ for measurement of jump height. The producer FITRONIC s.r.o. guarantees accuracy and reliability of the device with certified simultaneous measurements with a spring mat from the company KISTLER.

The research was approved by the Ethical Committee of Matej Bel University in Banská Bystrica.

Data Analyses- In presented study we have used within periphrastic characteristics of descriptive statistics arithmetic average ($\bar{x}$) from position measures and standard deviation (SD) from variability measures. We determined the importance of differences of the level of jump abilities between playing groups with One-way analysis of variance (ANOVA). The effect size coefficient was assessed using “Eta Squared – η^2 ”, calculated as common ratio of intergroup and total amount of squares. Levene's Statistic was used within adequacy of usage One-way ANOVA for determination of homogeneity of variances. Normal division of residuals was observed with Shapiro-Wilk test. The probability of type I error (α) was set at 0.05 in all statistical analyses Statistical analysis was realized with software IBM® SPSS® Statistics V19 (Statistical Package for the Social Sciences).

Results

In the testing of Squat jump and Countermovement jump we have determined almost identical average performance of players according to their playing positions in field (Table 1).

Table 1 The average level of jump abilities of individual groups according to their playing positions ($n = 38$)

Playing group	Squat jump (cm)	Countermovement jump (cm)
Defenders ($n = 15$)	36.3 ± 4.0	37.3 ± 4.4
Midfielders ($n = 16$)	37.1 ± 4.4	37.8 ± 5.9
Forwards ($n = 7$)	36.7 ± 2.9	37.8 ± 3.6

One-way ANOVA has shown that there were no significant differences between playing positions (Squat jump: $F_{(2,35)} = 0.164$, $p > 0.05$, $\eta^2 = 0.01$; Countermovement jump: $F_{(2,35)} = 0.050$, $p > 0.05$, $\eta^2 = 0.003$). Upon this deduction we did not determine differences between individual playing groups with adequate post hoc test.

Discussion

We agree with statements of Reilly, Bangsbo & Franks (2000) that soccer players do not have to dispose of extraordinary performance in any area of physical performance but they must have adequate high level within all areas. Bunc & Psotta (2001) notice that physiological preconditions and norms are necessary conditions for success at the professional level, although not sufficient. Speed and speed-power movement abilities belong to limiting ones in soccer, especially at elite professional level. In spite of high demands from the

point of view of speed abilities during the match dividing at accelerating, decelerating and maximal speed and agility, it is necessary to perceive these components integrated. Integral component of complex speed performance of a soccer player are his jump abilities too. Regarding game demands, high level of jump abilities presents an advantage in personal air duels but in running and total speed performance of a soccer player too, what the researches of Wisløff et al. (2004) prove, who accomplished significant correlation of sprint in 10 and 30 m and vertical jumps of elite international soccer players ($n = 17$, age = 25.8 ± 2.9 years).

The problems of comparison of the level of speed presuppositions of soccer players from the point of view of playing positions can be helpful partial indicator in monitoring and evaluating of different successful playing situations, e.g. microsituations forward – defender. In our study we have not discovered any significant differences of jump abilities in squat jump (SJ) or countermovement jump (CMJ) according to playing positions in field. In SJ was average performance of midfielders higher about 1.1% in comparison with forwards and about 2.2% with defenders. In CMJ midfielders and forwards achieved identical average performance which was higher about 1.3% in comparison with defenders.

In other studies dealing with comparison of performance of jump abilities from the point of view of playing positions and various performance levels the authors came to different findings. Lago-Peñas et al. (2011) found out that young soccer players ($n = 321$, age = 15.63 ± 1.82 years) achieved the best performances in vertical jumps in the group of goalkeepers and central defenders in comparison with the group of all defenders, midfielders and forwards. Forwards reached higher performance than midfielders and defenders. Haugen et al. (2012) found out that Norwegian players including senior and junior national soccer players ($n = 939$, age = 22.1 ± 4.3 years) in years 1995-2010 had reached significantly lower performance ($p < 0.05$) in vertical jumps in the group of midfielders compared to other groups divided according to playing positions. Gil et al. (2007) state the highest performance of forwards in all observed parameters of endurance, speed, agility and jump abilities. The authors mention that they did not examine elite young soccer players ($n = 241$, age = 17.31 ± 2.64 years). Wisløff et al. (1998) discovered that players from elite Norwegian League had achieved significantly higher level of jump abilities in the group of defenders and forwards in comparison with the group of midfielders. Mujika et al. (2009) did not determine differences ($p > 0.05$) between the height of vertical jumps of elite senior soccer players and elite young soccer players. Gissis et al. (2007) compared performance of young soccer players ($n = 54$) divided into group of young national soccer team of Greece, high-performance young soccer players and recreational soccer players. Considering jump abilities there were observed differences ($p < 0.05$) among national soccer team and other groups. There were not observed differences in evaluation of jump abilities among 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 Super League from the point of view of several anthropometric and condition parameters. They found out that tolerance of lactate, isokinetic power of the knee extensors and performance in jump abilities showed higher values ($p < 0.05$) in the team which belonged to three best teams of Super 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 jump abilities in comparison with European and African players.

Considering the level of jump abilities Arnason et al. (2004) discovered that jump height of elite Icelandic soccer players was SJ = 37.8 cm and CMJ = 39.4 cm. Casajús (2001) discovered that the jump height of Spanish elite team ($n = 15$) was SJ = 39 cm and CMJ with use of arms = 47.8 cm. Boone et al. (2012) found out that adult soccer players ($n = 289$) of six teams in Belgian Pro League achieved average performance (SJ = 40.7 ± 4.6 cm and CMJ = 43.1 ± 4.9 cm). In our study average performance of all players in field was 36.7 ± 3.9 cm in SJ and 37.6 ± 4.9 cm in CMJ. The results of goalkeepers are missing in average performance of our group. Several goalkeepers did not join research from personal or health reasons and hence goalkeepers were not included in evaluation of research results.

It is necessary to mention other limits of carried research too. Jump abilities are only a partial indicator of complex non-specific and also specific speed demonstration and speed performance of the soccer player. We also have to evaluate other components as frequency speed, reaction speed, direct accelerating and running speed, but specific speed demonstration with the ball too, so that we can create evaluation of complex speed-dynamic performance of soccer players. The certain limit presents unrepeatable measurement together with limitation in reliability too. The unrepeatable 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 individual teams.

Conclusions

The results of statistical analysis have shown that elite Slovak soccer players dispose of even performance in jump abilities from the point of view of playing positions in the field (Squat jump: $F_{(2,35)} = 0.164$, $p > 0.05$, $\eta^2 = 0.01$; Countermovement jump: $F_{(2,35)} = 0.050$, $p > 0.05$, $\eta^2 = 0.003$). Presented data can serve as certain norm or standard of elite soccer players from the point of view of jump abilities. Results of this study can be a useful material for scientists, but for soccer and condition coaches, experts and people interested in soccer too.

Acknowledgement

The study is a part of the researched project VEGA 1/0414/15.

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