

## VARIATIONS OF JUMP ABILITIES IN YOUNG SOCCER PLAYERS IN PREPARATORY MICROCYCLES

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Original scientific paper

### Abstract

The aim of the study was to compare performance confronted on jump abilities during these days of the week (Tuesday, Wednesday, Thursday and Friday) in the group of young soccer players ( $n = 10$ ; age =  $14.2 \pm 0.2$  years; height =  $169.8 \pm 10.9$  cm; weight =  $55.6 \pm 10.2$  kg) in microcycles of preparation period of I. competition year 2007/2008. Performance during single days was measured with a test – standing broad jump. Criterion of performance evaluation was distance – the length of standing broad jump with accuracy 1cm. Friedman test was used for determination of significance of differences in period under consideration. Nemenyi post-hoc test was used for determination of significance of differences in performance between single days. Statistical significance of differences in the study was determined at standardly used level  $\alpha = 0.05$  with software IBM® SPSS® Statistics V19 and R Project. Friedman test has shown significant differences during period under consideration ( $\chi^2_{(3)} = 13.701, p < 0.05$ , Kendall's  $W = 0.23$ , effect size weak). Nemenyi post-hoc test has shown significant differences between Wednesday and Thursday, and Wednesday and Friday ( $p < 0.05$ ). There were no significant differences between other days ( $p > 0.05$ ).

**Keywords:** length of jump, condition training, microcycle, preparation period

### Introduction

Sport chronobiology, which is dealing with research of sportsmen's performance, respects time laws and health aspect, presents potential of sport performance increasing. Sport chronobiology can be considered as interdisciplinary science presenting new approaches in solving of questions in sport training and preparation of sportsmen. One of aspects show to make sport training more effective and improve its quality is respecting of natural biological rhythmicity of sportsman's organism (Jančoková, 1998). Biological rhythms are matter of individuals and correspond with present modern trends of individualization of sport training in team games too. One of aims of sport chronobiology, which is dealing with sportsmen's performance from time aspect, is research and detection of optimal time periods and cycles of development of movement abilities, preconditions and movement skills (Bendíková & Jančoková, 2013). Other aim is correct short and long timing and improvement of sport form. The most detailed explored area of sport chronobiology is diurnal rhythms which concerns variations of sport performance in light phase of the day. Jančoková (1996, 2000) was dealing with research of performance of women's basketball team during weekly training cycle and problem of biorhythms. Kalinková (2005) was observing weekly rhythms in sport preparations of modern gymnasts. Jančoková (1996) found out variability of performance of basketball players. Average performance on Monday, Thursday and Friday was lower than average performance on Tuesday and Wednesday. She determined maximal average performance of the team on Tuesday and minimal average performance on Thursday. Basketball players had achieved the best performance during weekly microcycle on Tuesday and Wednesday according to her research.

Kalinková (2005) states after her research that the most effective day from the whole 5-days work week is Wednesday. In researches how biorhythms influence sport performance Atkinson & Reilly (1996) recommend to consider the influence of familiarization too, so-called test-retest, aside from other factors. This so-called test-retest is eliminated more by movement preconditions (abilities) than by skills. Our study is carried out on movement preconditions on the ground of statement mentioned above. In addition 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. We agree with Reilly (1997), Psotta et al. (2006), Orendurff et al. (2010) who say that soccer is intermittent movement activity. It 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. Andrzejewski et al. (2012) found out in professional players of European leagues that 90% of all realized sprints are up to 5 seconds. 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). The studies of Bangsbo, Mohr & Krstrup (2006), Bangsbo, Iaiia & Krstrup (2007) state in 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 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. Grasgruber & Cacek (2008) state the length of sprints ca. 15m and generally no more than 30m, every ca. 90s, it means 0.8 to 1km in the whole match. Faude, Koch & Meyer (2012) in offensive phase by scoring state on example of professional players that performance in direct sprint is the most important component. Most sprints in this activity occur without rival and ball. According to authors (Holienka, 2003; Psotta et al., 2006; Grasgruber & Cacek, 2008) jump abilities participate in running starting speed and running acceleration from movement abilities at most. Lakoma (1984, In Psotta et al., 2006) found out that jump abilities participate crucially in running starting speed and running acceleration ca. from 10 to 12m of running which presents 1.85 to 2.00s. We have compared performance in the group of young soccer players confronted on jump abilities during the days of the week in microcycles of preparation period. We have used knowledge about sport chronobiology and structure of performance in soccer.

## Methods

### *Characteristics of the group*

The observational group consisted of soccer players of FK Dukla Banská Bystrica, under-16 „A“ category ( $n = 10$ ; age =  $14.2 \pm 0.2$  years; height =  $169.8 \pm 10.9$  cm; weight =  $55.6 \pm 10.2$  kg) who were preparing for playing in the 1. league of the group „Stred“ led by a coach – a holder of coaching license EURO PRO. Soccer players were students of primary schools in Banská Bystrica and they were in sport preparation for 7 to 8 years in time of research. The coach and players of the group agreed with evaluation and publication of measurement results.

### *Organizing*

Research was realized during two weekly microcycles. Measurements took place in preparation period of I. competition year 2007/2008 from July 24<sup>th</sup>, 2007 to August 10<sup>th</sup>, 2007. Generally two measurements were realized on Tuesday (July 24<sup>th</sup> and August 7<sup>th</sup>), two on Wednesday (July 25<sup>th</sup> and August 8<sup>th</sup>), two on Thursday (July 26<sup>th</sup> and August 9<sup>th</sup>) and two on Friday (July 27<sup>th</sup> and August 10<sup>th</sup>), from which we have calculated average performance of individuals and average performance of the group during days of the week. Every day measurements took place at the same time during the day – in the morning at 10 o'clock when we as well as Jančoková (2000) can speak about the first daily peak of performance. We had focused on these two weeks because both weeks were “tuning” microcycles. Content – loading and intensity were identical in all training units during all measured days. Common ratio of parts of playing preparation consisted of playing training (40%), playing practice (50%) and condition training (10%), what is characteristic for

“tuning” microcycles (Kačáni, 2000). Measurements were always realized after the same, in advance prepared warm-up in field of primary school in Bakossová Street in Banská Bystrica. In time of measurements we had not observed significant temperature differences.

### *Measuring procedure of jump abilities*

We had measured jump abilities with a standard test – standing broad jump. Soccer players had 2 attempts. We had measured both attempts and used better attempt for further processing of results. Results were measured with accuracy of 1cm. In this study we analyze performance of the group and individual performance from the point of view of jump abilities during single days of measurements (Tuesday, Wednesday, Thursday and Friday) as average performance from two weeks (2 measurements on Tuesday, 2 on Wednesday, 2 on Thursday and 2 on Friday). We analyze average performance of the group with accuracy of one decimal (0.1cm). The research was approved by the Ethical Committee of Matej Bel University in Banská Bystrica.

### *Statistical analysis*

In presented study we had used within periphrastic characteristics of descriptive statistics arithmetic average ( $\bar{x}$ ) from position measures and standard deviation (SD) from variability measures. We had used Friedman test for dependent selections and wanted to find out if there are any significant differences between performances of the group during examined period. Kendall's Coefficient of Concordance (W) was used for evaluation of effect size (Green & Salkind, 2008).

Coefficient was interpreted as follows: 0 – 0.20 – very weak effect, 0.20 – 0.40 – weak effect, 0.40 – 0.60 – moderate effect, 0.60 – 0.80 – strong effect, 0.80 – 1.00 – very strong effect (Rovai, Baker & Ponton, 2014). One-way repeated-measures analysis of variance (RM-ANOVA) could not be used because there was not fulfilled the request of normal division of residuals ( $p < 0.05$ ) which is detected by Shapiro-Wilk test. Nemenyi post-hoc test was used for determination of significance of differences between single days of the week. The probability of type I error (alpha) was set at 0.05 in all statistical analyses. Statistical analysis was realized with IBM® SPSS® Statistics V19 (Statistical Package for the Social Sciences) and R Project.

## Results

The analysis of results has shown (Table 1) that the highest performance of players in the group on an average was noticed on Tuesday ( $204.3 \pm 10.0$ cm), then on Wednesday ( $203.6 \pm 9.4$ cm), on Friday ( $199.8 \pm 13.5$ cm) and the lowest performance on an average was achieved on Thursday ( $198.9 \pm 11.2$ cm). We have found out significant differences during period under consideration with Friedman test ( $X^2_{(3)} = 13.701$ ,  $p < 0.05$ , Kendall's  $W = 0.23$ , effect size weak).

Table 1 Results of the test of jump abilities in centimeters (cm)

Player	Tuesday	Wednesday	Thursday	Friday
1.	191.0±12.7	188.5± 4.9	185.0± 7.1	174.0±12.7
2.	194.0± 9.9	198.5± 3.5	189.0± 1.4	194.5± 4.9
3.	200.5± 6.4	201.5± 0.7	191.5± 0.7	198.5± 2.1
4.	207.5± 0.7	202.5± 6.4	201.5±12.0	205.0± 7.1
5.	203.0± 7.1	212.5± 2.1	199.5± 7.8	210.0±19.8
6.	197.5±10.6	194.0± 0.0	187.5± 0.7	186.5± 3.5
7.	220.0± 4.2	214.0±17.0	220.0± 0.0	217.5± 3.5
8.	210.0± 2.8	205.5± 2.1	207.5± 3.5	206.0± 1.4
9.	207.5± 0.7	210.5± 4.9	201.5± 2.1	201.0± 0.0
10.	211.5± 2.1	208.5± 7.8	205.5± 2.1	205.0± 4.2
x	204.3	203.6	198.9	199.8
SD	10,0	9.4	11.2	13.5

(Note: x and SD mentioned in Table 1 are calculated from primary values from all days due to higher accuracy)

Table 2 Statistical evaluation of differences in performance of players in the group during the test of jump abilities on single days of the week

Day of the week	Tuesday	Wednesday	Thursday	Friday
Tuesday		p > 0.995	p > 0.068	p > 0.068
Wednesday	p > 0.995		* p < 0.036	* p < 0.036
Thursday	p > 0.068	* p < 0.036		p > 1.000
Friday	p > 0.068	* p < 0.036	p > 1.000	

\* - statistically significant difference at level  $\alpha = 0.05$  ( $p < 0.05$ )

We have wanted to know differences between single days with Nemenyi post-hoc test (Table 2) on the ground of above mentioned findings. There was significantly different performance ( $p < 0.05$ ) between Wednesday and Thursday and between Wednesday and Friday. There were no significant differences between other days ( $p > 0.05$ ).

**Discussion**

High level of limiting movement abilities is one of limiting factors of individual high-quality playing performance, and thereby playing performance of a team. On the other hand, neither excellent level of movement abilities means automatic transfer to individual playing performance of the player, and thereby playing performance of a team. Inadequate level of movement abilities limits playing performance of a player, especially 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 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 professional level, although not sufficient. Speed and speed-power movement abilities belong to limiting ones in soccer. Therefore it is necessary to stimulate them constantly with stimuli, despite of substantial genetic limitation, especially in condition training in preparation periods with specific and non-specific means and find new approaches from the point of view of their stimulation. Biological rhythms present a reserve how to make training process more effective and improve its quality. We have found out changes in performance from the point of view of jump abilities between days during weekly microcycles of preparation period in our group of players.

Although statistically significant changes were noticed only between Wednesday and Thursday ( $p < 0.05$ ) and Wednesday and Friday ( $p < 0.05$ ), some trends of higher performance were indicated on Tuesday too. We can state that trends or tendencies to higher average performance of the group were observed in the first half of examined period – a week, it means on Tuesday and Wednesday, while in the second half (Thursday, Friday) there was noticed lower average performance. Given findings can be connected with existence of temporal training stereotypes, so that players from our group are adapted to higher performance in term of explosibility and acceleration in the first half of the week. Barbosa & Albuquerque (2008) analyzed performance of long-term memory in the morning and in the afternoon in students who were divided upon determined chronotypes. They did not determine differences in term of chronotypes; but they noticed higher performance in the afternoon in those students who were used to learn just in this phase of the day. Brown, Neft & LaJambe (2008) divided young sportsmen into three groups in their research ( $n = 16$ , age =  $19.6 \pm 1.5$  years) – morning types, evening types and stable (neutral) types. They determined performance of early morning hours from 5 to 7 AM and late in the afternoon from 4.30 to 6 PM. Authors did not detect significantly different performance upon typology (chronotype) of sportsmen in term of day time and state that training time stereotypes of sportsmen could influence data shown. Atkinson et al. (2005), Brown, Neft & LaJambe (2008) state upon researches that training time stereotypes of sportsmen can have an influence on daily performance of sportsmen. Knowledge about existence of training time stereotypes can significantly help in planning and organizing of training units and creating of microcycles because it is possible to prepare an organism ahead for desired loading from time aspect. Generally we respect

health aspect with adequate loading of organism of soccer players and sportsmen and we prepare specifically an organism for desired loading. It is necessary to mention limits of realized research too. High non-homogeneity of intraindividual performance of some players can be considered as the first limit, what is clear from high values of standard deviations of average performance from two weeks. The second limit is low number of players in the group. The next limit is the fact that measurements were realized only during two microcycles. We tried to work with possibilities which observed soccer team offered us in their content and time schedule. We do not recommend doing measurements during two and more weeks in sequence in such researches according to our experience. The reason is monotony of tests and possible loss of motivation and concentration of measured players. Measurements were not realized on Saturday, Sunday and Monday on the ground of limited content and time schedule. Both weeks on Saturday were planned for preparation games and we did not want to disturb

concentration of players with measurements. Players had a day off on Monday and Sunday. Presented study regarding given limits can be an inspiration for realization of similar researches and next verification of variations of movement abilities but also skills and internal physiological parameters during the week.

### Conclusion

Jump abilities are limiting movement preconditions of individual high-quality playing performance of the soccer player. The results of the study have shown differences in performance of the group during the week (microcycle). Time factor can play an important role in planning and realization of sport training. Good timing of training load from the point of view of days in the week can help to prepare organism of the soccer player (sportsman) for required performance. Presented study can be an inspiration for head and condition coaches of soccer teams, but also for people who are interested in problems of sport chronobiology.

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### Sažetak

*The aim of the study was to compare performance confronted on jump abilities during these days of the week (Tuesday, Wednesday, Thursday and Friday) in the group of young soccer players (n = 10; age = 14.2±0.2 years; height = 169.8±10.9 cm; weight = 55.6±10.2 kg) in microcycles of preparation period of I. competition year 2007/2008. Performance during single days was measured with a test – standing broad jump. Criterion of performance evaluation was distance—the length of standing broad jump with accuracy 1cm. Friedman test was used for determination of significance of differences in period under consideration. Nemenyi post-hoc test was used for determination of significance of differences in performance between single days. Statistical significance of differences in the study was determined at standardly used level  $\alpha = 0.05$  with software IBM® SPSS® Statistics V19 and R Project. Friedman test has shown significant differences during period under consideration ( $X^2_{(3)} = 13.701, p < 0.05$ , Kendall's W = 0.23, effect size weak). Nemenyi post-hoc test has shown significant differences between Wednesday and Thursday, and Wednesday and Friday ( $p < 0.05$ ). There were no significant differences between other days ( $p > 0.05$ ).*

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Received: December 14, 2014

Accepted: May 10, 2015

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