

Relationship Between Flexibility, Explosive Strength and Speed of Running in Young Soccer Players.

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Abstract:

The aim of the study was to define relationship between flexibility, explosive strength and speed of running. Fifty-six young (aged 15-19) czech soccer players participated this research. Data about flexibility (sit and reach test – HF), explosive strength (countermovement vertical jump – VJ) and speed of running (10 meters sprint – 10m) were collected. For analyse the data software Statistica 12 was used. Kolmogorov-Smirnov test and correlation analysis were made. Results suggest there is statistically significant relationship between HF – VJ and HF – 10m ($p < ,05$). These findings indicate that muscle flexibility should be specifically trained in football training process.

Key words: soccer, explosive strength, flexibility, sprint, correlation

Introduction

Soccer is a team sport taxing both aerobic and anaerobic energy transfer systems and including short high-intensity activities interspersed with longer low-to-moderate activities [3]. However, during a match, the duration of displacement at high velocities does not last longer than 3 seconds. Despite their short duration, the response to these different and rapid movements is essential in soccer and the sprint performance may be considered relevant in soccer [11]. The average distance covered at high intensity by elite soccer players during competition is about 15 meters [8], therefore, on many occasions 5, 10 or 15 m sprint tests have been used to assess the acceleration capacity [11]. Speed in terms of sports requiring explosive strength is determiner of performance. Speed performance is highly dependent on the relative muscle strength [2]. The ability to start and accelerate has been linked to maximal concentric strength and rate of force development [3]. Flexibility refers to the absolute range of movement in a joint or series of joints, and length in muscles that cross the joints to induce a bending movement or motion [4]. The relationship between flexibility and key factors for performing soccer-specific skills, such as sprinting, jumping, agility and kicking was proved [1]. A tendency to muscle shortening is listed as factor that contributes to the appearance of some diseases and syndroms e.g. muscle strain, postural deviations or reduction in physical performance [4]. It has been seen that flexibility of young players and their speed characteristics can help them to participate in sports branches [2].

Methods

Participants

Fifty-six male soccer players (age 17 ± 2 years), competing in the Youth First Czech League participated voluntarily in this study. All players had participated in their regular endurance, sprint and specific soccer training programme of 5-6 days per week. None of the participants reported any current or ongoing neuromuscular disease or musculoskeletal injuries.

Procedure

In this study, relationship between flexibility, explosive strength and speed of running was examined. The physical performance was determined by testing usually evaluated in soccer. The first evaluation session consisted of running speed (10 m sprint). The second evaluation session consisted of vertical jump and the third session consisted of measuring flexibility. The tests were carried out during regular season in October 2015. Before testing a warm-up was performed which consisted of seven-minute low-intensity jogging, dynamic stretching of main muscle groups and special running exercises (such as lifting, skipping, etc.). Tests were conducted on an artificial grass indoors. The temperature was held at 21°C.

Performance tests

Speed of running (10m): Each player performed an acceleration test consisting of two maximal sprints over 10 m (only better time was used). Rest between each sprint was three minutes. Starting point was placed 50 cm from starting line. There were no acoustic or visual signal, thus players started when they felt ready. For recording time photocell gates (placed 0,5 m above the ground) were used. When the player passed through the first gate, timer was automatically started. When the player passed through the second gate, timer was stopped.

Vertical jump (VJ): For measuring explosive strength of soccer players a countermovement jump was performed. Players performed three jumps, and just the best one was used. Meter scale placed on the wall was used for measuring height of jumps. At the beginning player stood next to the wall, fully extended right arm on the scale and the height was recorded. Then performed jump with maximal power and touch the wall as high as possible. Countermovement was allowed. Measured values was deducted.

Flexibility (HF): For measuring flexibility of hamstrings and lower back, sit and reach test was used. Each player sit in front a box with meter scale on the top and performed a maximal forward bend. Knees had to be on the ground and player held in the position for five second. Movement had to be slow. Each player had one attempt. Values was measured in centimeters (number 0 cm was at the level of players feet).

Statistical analysis

Data were analyzed using Statistica 12 Software. Descriptive statistics belonging to all variables were calculated as arithmetic mean (M) and standard deviation (SD) and showed in the Table 1. All the variables were normally distributed and satisfied the equality of variances according to the Kolmogorov-Smirnov test. Statistical significance was set at $p < .05$. Pearson correlation coefficient (r) was used to examine the relationship between HF, VJ and 10 m.

Table 1: Arithmetic means and standard deviation for all tests

Variables, N = 56	M	\pm SD
10 m	1,7552	0,0750
VJ	49,0893	4,4447
HF	11,3929	5,4169

Legend: 10 m = 10 m sprint; VJ = vertical jump, HF = hamstring flexibility

Results

The correlation coefficients are presented in Table 2. Relationship between measured values can be observed. Coefficients by Salaj and Markovic (2011) were used for scaling: low ($r \leq 3$), moderate ($3 < r \leq 7$), and high ($7 < r$). The significant correlations ($p < .05$) were found between hamstring flexibility and vertical jump and between hamstring flexibility and 10 meters sprint. All of the relationships can be define as moderate.

Table 2: Correlation coefficients between 10m sprint, vertical jump and hamstring flexibility

	10m	VJ	HF
10m	1,0000	-0,4154 *	-0,4356 *
VJ	-0,4154 *	1,0000	0,3867 *
HF	-0,4356 *	0,3867 *	1,0000

Legend: * = $p < .05$; 10 m = 10 m sprint; VJ = vertical jump, HF = hamstring flexibility

Discussion and conclusions

The main findings of this study were moderate significant correlations between hamstring flexibility and vertical jump, and hamstring flexibility and 10 meters sprint.

Some previous studies [9, 10] have recommended the use of dynamic stretching prior to exercise and athletic events rather than static stretching as a result of the stretching-induced force deficit [6]. Whereas another study [5] shows, that static stretching at the end of every training session prevents the negative effect of the load on hamstring flexibility and can influence improvement in flexibility. Another study suggests, that hamstring flexibility is a key factor for soccer specific skills and muscle flexibility must be specifically trained for better performance [1].

To sum up, based on experiences from soccer training process, improving of flexibility is really underestimated. It is recommended to perform static stretching routine at the end of the training sessions. And before every training session or match, dynamic stretching exercises are suitable, for better results.

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