YEAR DYNAMICS OF THE DEVELOPMENT OF MOTOR ABILITIES OF THE ATTENDANTS OF SOCCER SCHOOL ‘DIF’

Abstract
Primary goal of this study was to follow the dynamics of the development of motor abilities of the attendants of soccer school ‘dif’ in the year cycle of trainings. In addition, the aim of this longitudinal study was also to evaluate the working programme of the school, and its influence on the development of young soccer players’ motor abilities. Twelve soccer players of older group (10 ± 0.9) and fifteen players of younger age group (7.3 ± 0.8), of Soccer school ‘Dif’ participated in the survey. The experiment consisted of two sessions of tests, organized at the interval of twelve months, and between the sessions the organized soccer training was carried out. Work programme included three trainings per week, each consisted of: 10 - 15 minutes of warming up with the ball (e.g. juggling, ball carrying, repetition of learned technical elements, etc.), 10 - 15 minutes of coordination exercises (e.g. running, running over the ladders, hurdles, etc.), 20 - 25 minutes of teaching of technical elements (e.g. dribbling, passing, kicking, etc.) and 10 - 15 minutes of the game directed to scoring goals (two goals game, four goals game, etc.). The test included tests for the evaluation of speed, general and specific agility, and indirect tests for the evaluation of legs performance. The acquired results show that the working programme had a positive influence on the development of motor abilities of the school attendants, in the majority of variables. The working programme had greater influence and better retest results with the older attendants, while with younger attendants, the programme had the greatest influence on the specific agility with and without the ball. According to the results acquired from monitoring the motor ability development and the evaluation of working programme, certain modifications of the programme are proposed, primarily in working with younger age group.

Key words: TEST / WORKING PROGRAMME / SELECTION / TRAINING

INTRODUCTION
Soccer is the game that over 240 million people actively practise in more than 200 countries all over the world (Hillis, 1998). The continuous growth, popularity of the game of soccer can be noticed in every social aspect of contemporary living. Recently, that popularity is seen in a growing number of organized soccer schools for the youngest attendants, beginning even with 3-4 year old boys and girls.

The game of soccer, since its beginnings till the present, has undergone large number of changes in tactical and technical sense. The rules of the game have also gone through a certain modification, and, what is important for this study, the demands in functional and motor characteristics of players have evolved. Contemporary game requires moves and activities with especially fast, powerful and explosive
capabilities. By the analyses of competition activity of the players it was concluded that there is an intermittent structure of moving with large number of actions with or without a ball, which are of a highly intensive character and between them there are periods of low intensive activities (Svensson & Drust, 2005). Considering these facts, it is necessary to identify and evaluate those soccer attendants who will be able to meet the demands of world-class soccer, and to apply to world-class sports results. Soccer is in the group of poly structural, acyclic sports, where the prediction of success is considerably hard and depends on a large number of genotype and phenotype factors, quality and character of technological process (training), health status and a large number of additional factors.

Detection and identifications of gifted players is much harder in team sports (like soccer) than in individual ones (running, cycling, rowing) where the predictors of the abilities are easier to describe scientifically (for details look Reilly et al., 2000). For the evaluation of the motor abilities condition and the prediction of possible success of a player of the youngest age different tasks (tests) are used. The tasks assess speed abilities, certain types of strength display in general and specific conditions, strength capacity through running with the change of direction (agility), specific tests of skill and morphological characteristics of the attendants. Testing of physical abilities is an efficient device for the estimation and monitoring of young players and its function is to develop technical skills, tactical education, teamwork and cognitive abilities. Each testing and comparing results with previous testing, as well as with direct training programme, is an important data base that can be the source of useful information for the education and improvement of coaches.

However, the evaluation and assessment of the success of young players, that servers for long-term projection, is extremely hard due to individual differences in time and tempo, changes of anthropometric characteristics, functional capacities and motor disbalance during puberty and maturing period (Malina et al. 2004). However, the evaluation of the efficiency of the attendants that are in pre-puberty period, which means that there do not exist noticeable biological and morphological differences, can give valid data and more accurate information about initial adaptations to certain activities. Changes of motor abilities in the developing period of children, who systematically practice soccer, cannot be observed separately from the specific quality of the conditions where the soccer activity takes place. However, one cannot explain game efficiency separately from the development of general motor abilities of a player, which is the objective foundation for the display of specific motor abilities (Kukolj et al., 2007).

There is a large number of standardized tests of physiological capacities, and the tests for dominant motor abilities, which evaluate the capability of every individual and control the degree of organism adaptation to different training methods. Besides, lately there is a growing number of evaluating tests of soccer skill (ball carrying, pass precision...)

The subject of research of the studies who dealt with younger age categories in soccer are: validity and trustworthiness of certain tests (Mirkov et al., 2008; Wragg et al., 2000), changes in abilities depending on chronological and biological maturing of players (Helsen, 2000; Malina et al, 2005), comparison of skills between younger players and seniors categorised according to the competition level or training years and occasionally relations between tests of skill and performance, i.e. outcome in the game. Also, there are studies that deal with motor abilities (strength, speed, agility, flexibility...) of players at different success levels (Vaeyens et al., 2006), studies with the themes like motor abilities and soccer skills of young players compared with their age-mates who do not practice soccer. The results show that there are differences between older players and the younger ones, and the differences between players of different competition ranks – players who compete in a higher rank have higher level of certain skills (e.g. speed, endurance) compared to the ones who compete in a lower competition rank, and also age-mates who practice soccer have better results in comparison with the ones who do not practice it.

There is a small (or insufficient) number of longitudinal studies that deal with the subject of dynamics of the development of motor abilities in training processes where the accent is on the training of elementary technique with the youngest attendants.

The aim of this study was to determine or to assess the influence of a clearly defined schedule, which is based on the training of elementary soccer technique, on the dynamics of the development of motor abilities in younger (U8) and older (U10) group of attendants in soccer school ‘Dif’.

In this study, the results were longitudinally collected during the training cycle of one year. The
The importance of this study is in the assessment of the existing schedule and work programme in the organized soccer school. The goal of the study is to define practical implications which would give certain guidelines for its potential (possible) corrections, connected with the amount of work on the development of motor abilities and skills at this age.

Consequently, the subject of this study are changes in the development of motor abilities of boys, who have not entered the phase of intensive growth and development and who practice soccer, i.e. are the attendants of the organized soccer school.

**METHODS**

**The sample of subjects**

Twelve players of the older group (U10) and fifteen players of the younger group (U8) of the organized Soccer school ‘Dif’ participated in the study (Table 1). None of the subjects had any medical problem (the medical examinations were conducted before the testing in the consulting room of FSPE) or injuries of locomotor apparatus before and during the study. Before the first testing all the subjects and their parents received detailed explanations, including the aim and the procedure of the test, as well as special indications concerning possible risks of injuries. All the subjects signed the agreement to willingly participate in the survey.

**Table 1.** Demographic profile of younger group players – U8 (n=15) and older group U10 (n=12). The data are shown as a middle-value (MV) and standard deviation (SD).

<table>
<thead>
<tr>
<th>Characteristics of soccer players</th>
<th>U8</th>
<th>U10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>7.3</td>
<td>10</td>
</tr>
<tr>
<td>Body height (cm)</td>
<td>130.5</td>
<td>142.1</td>
</tr>
<tr>
<td>Body mass (kg)</td>
<td>27.2</td>
<td>32.6</td>
</tr>
</tbody>
</table>

**Training process and measurement procedure**

The experiment consisted of two sessions of testing, organized with the interval of twelve months during which the organized soccer training was carried out. The training programme in this period consisted of three training classes of soccer in the micro cycle of 7 days. The first two training classes lasted 60 minutes each and most commonly consisted of 10 – 15 minutes of warming up with the ball (e.g. juggling, ball carrying, repetition of learned technical elements, etc.), 10 - 15 minutes of coordination exercises (e.g. running, running over the ladders, hurdles, etc.), 20 - 25 minutes of teaching certain technical element (e.g. dribbling, passing, kicking, etc.) and 10 - 15 minutes of a game directed to scoring goals (two goals game, four goals game, etc.). The third training class was carried out at the end of the micro cycle and it lasted 90 minutes. During the third training class, the first three parts in the structure of soccer class were the same as in the previous micro cycles, while the fourth part of the class lasted a little longer , 30 -40 minutes. Soccer class of the younger group differed from the one of the older group, primarily in the larger amount of the application of playing methods and exercises in the relation player – ball 1:1 (ball control, feint movements, ball carrying).

The first test was carried out at the beginning of September, while the retest was carried out twelve months later, at the beginning of October the following year. Both tests were organized at the same time of the day (12.00 – 12.30). Before the first test, the subjects were made familiar with the test which meant explanation and demonstration of the tests, and after that the subjects tried to perform the tests as many times as they needed to do every test right. Before the test there was a procedure for warming up which lasted 20 minutes. It consisted of body shaping exercises with motion and active and passive stretching exercises. The test consisted of tests for the evaluation of speed, general and specific agility and indirect tests for the evaluation of legs performance. Two experienced persons in charge of measuring carried out the testing process. The tests, which were used for the evaluation of these abilities, are described in detail in the following paragraph.

The evaluation of the subjects’ morphological status was carried out according to the data collected by measuring body height and body mass. During the measurement the subject was barefoot and minimally
dressed. In the measuring of body height the Martin antrophometer was used, the precision of which is 0.1 cm, and in the measuring of body mass we used the electronic scale with the precision of 0.1 kg.

Motor abilities evaluation included measuring of seven variables with every subject (Mirkov et al., 2008): 10 meter sprint from standing position (10S), 10 meter sprint from flying start (10FS), 20 meter sprint (20 S), zig-zag (ZZ), zig-zag with the ball (ZZB), jump with semi squat with hands on the hips (HJHH) and jump with semi squat with the arms swing (HJS). The tests were organised in such way to avoid the influence of one test on the other. Before the test, the subjects were explained in details the protocol of the test, followed by practical demonstration. Every subject had one test attempt, followed by two measured attempts. Only better result was taken to the statistic analysis. There was a pause of 2 minutes between the attempts and 5 minutes between the tests.

For the measuring of time in the 20 meter sprint from flying start three pairs of photo cells were used. Photo cells were set on 10 and 20 meters. By cutting the beam of the first pair the measuring started, by cutting the beam of the second pair the time for 10 meters was measured and by cutting the third beam were measured the time from flying start and the total time of 20 meters, and by that the test ended. The subjects were instructed to run as fast as they could along the distance of 20 meters.

For the measuring of time in zig-zag test two pairs of photo cells were used. One pair was set to the start line and the other to the finish line. The subject was given the instructions to run at maximum speed through four sections of 5 meters each, which are connected and set at the angle of 100° between each of them.

For the measuring of time in zig-zag test with the ball two pairs of photo cells were used. One pair was set to the start line and the other to the finish line. The subject was given the instructions to carry the ball at maximum speed through four sections of 5 meters each, set at the angle of 100° between each of them.

Maximum height of the jump with squat with the hands on the hips was measured using the device Ergojump™ (computerised system Bosco). The subjects were instructed to, by holding their hands on their hips, from the standing position, quickly squat as a preparation for the rebound and, connected with that powerfully rebound.

Maximum speed for the jump with squat with the arms swing was measured using the device Ergojump™ (computerised system Bosco), which measures the height of vertical jump, expressed in centimetres, according to time spent from the moment of jump off till the moment of landing. The subjects were instructed to from the standing position, quickly squat as a preparation for the rebound and, connected with that, powerfully rebound with the arms swing.

**Statistic data processing**

Standard descriptive statistic analysis (middle value and standard deviation) was calculated for each variable. Considerable differences between test and retest were analysed using the dependent t-test. The level of statistic importance was at level $p<0.05$. All statistic tests were processed using SPSS 16.0 programme (SPSS INC, Chicago, IL).

**RESULTS AND DISCUSSION**

The acquired results, by monitoring the dynamics of the development of motor abilities, show that the work programme of the Soccer school ‘Dif’ had a positive influence on the development of the abilities in the majority of the observed variables. Considering age groups, there is a more significant progress in the abilities of the subjects from the older group compared to the younger one (tables 2 and 3). Also, it is important to point out that that differences in morphological characteristics between the individuals did not influence the acquired results in the test and retest, as seen in the values of standard deviations in the results, considering the fact that the 6 – 10 age (being the sample of subjects in this survey) is characterised by the uniform morphological development. In this period children are not significantly different in anthropometric and hormonal characteristics, so motor abilities are the objective indicator of their potential (Stratton et al., 2004).
The results acquired at the beginning and the end of the year training cycle (older group U10). The data are shown as a middle-value (MV) and standard deviation (SD).

<table>
<thead>
<tr>
<th>Tests</th>
<th>1. measurement</th>
<th>2. measurement</th>
<th>p-value</th>
<th>SE**</th>
</tr>
</thead>
<tbody>
<tr>
<td>MV</td>
<td>SD</td>
<td>MV</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>10S (c)</td>
<td>2,42</td>
<td>0,18</td>
<td>2,27</td>
<td>0,16</td>
</tr>
<tr>
<td>10FS (c)</td>
<td>1,84</td>
<td>0,21</td>
<td>1,79</td>
<td>0,16</td>
</tr>
<tr>
<td>20 S (c)</td>
<td>4,28</td>
<td>0,38</td>
<td>4,08</td>
<td>0,31</td>
</tr>
<tr>
<td>ZZ (c)</td>
<td>6,52</td>
<td>0,53</td>
<td>6,81</td>
<td>0,50</td>
</tr>
<tr>
<td>ZZL (c)</td>
<td>11,30</td>
<td>2,11</td>
<td>10,29</td>
<td>1,38</td>
</tr>
<tr>
<td>HJHH (cm)</td>
<td>21,6</td>
<td>4,5</td>
<td>23,9</td>
<td>3,9</td>
</tr>
<tr>
<td>HJS (cm)</td>
<td>24,4</td>
<td>4,7</td>
<td>28,1</td>
<td>6,1</td>
</tr>
</tbody>
</table>

* p - value: level of statistic importance at level p<0.05
**SE: Size effect: insignificant < 0.2; small 0.2-0.6; middle 0.6-1.2

The results acquired at the beginning and the end of the year training cycle (older group U10). The data are shown as a middle-value (MV) and standard deviation (SD).

Within the scope of the year training cycle (macro cycle), Soccer school ‘Dif’ realized 132 soccer classes (training units), through clearly defined programme (already described), that lasted 70 minutes on average. Along with the regular activities the attendants of the Soccer school ‘Dif’ played 22 games and had 10 classes of free activities. According to the results of the survey the quality of the school programme can be evaluated, and the good points and possible shortcomings in programme contents can be noticed.

Table 2 shows the results in the motor abilities tests carried out at the beginning and the end of the year training cycle, of the older group (U10). Statistically important differences were acquired in the test for the evaluation (measuring) of the acceleration (10S) and maximum speed at short distance (20S), then in the test for specific agility (ZZL) and in both tests for the indirect evaluation of legs strength (HJHH and HJS). Statistically important differences were not acquired only in the test for the evaluation of speed from flying start (10FS), as well as the test of general agility (ZZ), where negative effect size can be noticed, which means worse result in the retest. This result shows that the work programme of Soccer school ‘Dif’ did not make an influence on the development of these abilities, which means that the work methods that were applied did not include enough activities that would develop general agility and speed from flying start. Since it is known that agility is one of the more dominant abilities (by its importance) in the game of soccer, and the fact that it is necessary to work on the development of that ability in early years, it can be concluded that it is necessary to modify work programmes in this field. However, from table 2 can be seen that specific agility (with the ball) was considerably improved, and we can see from these results the work direction of the school – as many activities with the ball as possible. Considering effect size, which shows the quantity of the results change, it can also be seen that the largest degree of the improvement of the results is acquired on the tests for the evaluation of acceleration (10S) and the height of the jump with a swing (HJS). This result was expected, considering the fact that the primary goals in the motor development in this age group in the Soccer school ‘Dif’ are the work on the coordination and frequency of movements, the technique of moving without the ball and the exercises that require reaction speed in simple and complex situations. Significant result in the retest was acquired in the test HJAH where the subjects performed jumps without the arm swing. According to this result it can be said that the success in the jump tests is the result of the improvement of the jump technique, and of the legs strength development.

With the under-8 age group, the work is based on satisfying the basic needs of this population for movement and play. Until the end of this phase, (about 8 years old), the children become able to apply previously acquired experiences on present situations. For example, at a simple level, they can memo-
rize what they were shown or what they tried with the ball on the previous soccer class. At the same time, this ability is not constantly present. Still, they cannot perceive the consequences (e.g. if I do this, what will happen?). In accordance with that, the work on the development of motor abilities has to be filled with fun activities which will in an indirect way influence these abilities.

Table 3. The results acquired at the beginning and the end of the year training cycle (younger group U8). The data are shown as a middle-value (MV) and standard deviation (SD).

<table>
<thead>
<tr>
<th>Tests</th>
<th>1. measurement</th>
<th>2. measurement</th>
<th>p-value</th>
<th>SE**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MV</td>
<td>SD</td>
<td>MV</td>
<td>SD</td>
</tr>
<tr>
<td>10S (c)</td>
<td>2.42</td>
<td>0.13</td>
<td>2.43</td>
<td>0.11</td>
</tr>
<tr>
<td>10FS (c)</td>
<td>1.96</td>
<td>0.13</td>
<td>1.88</td>
<td>0.10</td>
</tr>
<tr>
<td>20S (c)</td>
<td>4.40</td>
<td>0.25</td>
<td>4.33</td>
<td>0.22</td>
</tr>
<tr>
<td>ZZ (c)</td>
<td>7.32</td>
<td>0.52</td>
<td>6.97</td>
<td>0.38</td>
</tr>
<tr>
<td>ZZL (c)</td>
<td>12.78</td>
<td>2.1</td>
<td>11.18</td>
<td>1.65</td>
</tr>
<tr>
<td>HJHH (cm)</td>
<td>17.6</td>
<td>2.2</td>
<td>18.9</td>
<td>1.5</td>
</tr>
<tr>
<td>HJS (cm)</td>
<td>20.4</td>
<td>2.3</td>
<td>21.9</td>
<td>2.8</td>
</tr>
</tbody>
</table>

*p - value: level of statistic importance at level p<0.05
**SE: Size effect: insignificant < 0.2; small 0.2-0.6; middle 0.6-1.2

Table 3 shows the results in the motor abilities tests carried out at the beginning and the end of the year training cycle, of the younger group (U8). Statistically important differences were acquired in the test for the evaluation (measurement) of speed from flying start (10FS), test for general agility (ZZ), and in the test for specific agility (ZZL). Statistically important differences were not acquired in the test for the evaluation of acceleration (10S), where negative effect size can be noticed, which means worse result in the retest, in the test for maximum speed at short distance (20S), and in both tests for the indirect evaluation of legs strength (HJHH and HJS). These results show that work programmes of the younger group of the Soccer school ‘Dif’ meet the basic principles, where the accent is put on the development of fundamental skills with the ball and on the creation of a wide basis of different movements with and without the ball. Thus, the positive influence on the results in retests in the tests of agility with and without the ball is the consequence of the work programme, based on the application of the method of game play, which, through different competition forms, demands from the attendants to control the ball in various and complex game situations. This approach to work satisfies the boys’ need for play, and the completion of certain polygons develops agility and the technique of ball carrying and ball control. The greatest effect was achieved in the test of agility with the ball (ES=0.77), which means that he greatest improvement was noted compared with the first measurement. It can be stated that the work principle at the relation 1:1 (ball: player) contributed to the improvement of the result.

Results in other tests without major improvements in retests, and on the empirical basis, show that the under-8 age group is not capable, mentally nor physically, to carry out programme contents where it is insisted on the details (analytical method of work), on learning isolated technique elements (jumps) and exercises which do not include ball. Also, due to weaker coordination and weaker technique of moving without the ball, the subjects were not able to give their maximum on the tests, primarily in jumps with and without arms swing.

For the purpose of increasing the efficiency of the work of Soccer school ‘Dif’, and according to the
acquired results, it is necessary in the work with the younger group to pay more attention to the technique of moving without the ball, more precise running, proper arms work during the movement, on jumps and rebounds... If we consider the fact that speed, movements frequency and reaction time are often the function of technique (Bompa, 2006), it is necessary to maximally master the movement technique so that it does not limit the player’s speed abilities.

The attendants of the Soccer school ‘Dif’, the subjects in this survey, are characterized by linear increase in body height and body mass, but still in a slightly less quantity than in the previous years of their lives. The period after ten years is characterised by tumultuous morphological development that has disproportional growth and development dynamics between individuals (Stratton et al., 2004). However, beside the proportion in terms of morphological development, it is necessary to consider the degree of maturity of every individual at this age. About the necessity for the evaluation of the maturity degree speaks the fact that with the children of the chronological age 8.2±0.1 years, the skeleton age goes from 6.3 to 9.4 years (Malina, 2003; Malina et al., 2004). Along with the evaluation of the maturity degree, skeleton age, Jaric and collaborators (2005) point out the necessity of results normalization in relation to the subjects’ body dimensions, by which more objective indicators of capabilities would be acquired.

From the aspect of projecting high-class sport result in soccer, there are five phases of long standing development (Balyi et al., 2005). The subjects of the younger group belong to the first, basic phase (6-9 years), while the subjects of the older group fall under the second phase – learn to train (9-12 years). According to the principles of the basic phase, which is a suitable period for the development of basic movement abilities and which is structured and organized through games and fun, it can be said that according to the results of this study, the work programme of the Soccer school ‘Dif’ largely responded to the demands for work with this age group of soccer players.

CONCLUSION

The results of this study, which monitored the development of motor abilities of the attendants of Soccer school ‘Dif’, in the year training cycle, indicate to positive adaptations of young soccer players to the training contents of the school’s work programme. Considering the fact that the whole work was based on the methods and training instruments with the ball, it can be concluded that the programme, besides the adoption of soccer technique, also positively influenced motor skills of young players. Also, according to the acquired results, it can be seen that there are differences in pre-test and retest results depending on the age categories of the attendants. The attendants of the older group made better results in retest compared with the younger group attendants.

The differences in the results between the groups are the consequence of different work forms in the two categories. The attendants of the older group, due to their mental and physical maturity, are capable of realising the contents where dominates the work on the development of coordination, movement technique, movement speed... The players of the younger group are not capable to keep the attention in longer time period, so the work is directed toward fun contents that, in an indirect way, develop primarily skills of handling the ball or specific soccer coordination, and then also motor abilities dominant for this age. The consequence of this approach is considerably better results of younger group in retest, test of agility with and without the ball, because they are, in their form, the closest to the activities carried out in the training. The players of the older group acquired better results in the tests for legs strength and running speed because their work programme was partly directed toward the development of those abilities. What is very important for the evaluation of work programme of Soccer school ‘Dif’ is the result in the test for the agility with the ball, because the primary task of the work programme is teaching the elements of soccer technique. Both groups of subjects acquired significantly better results in the retest, the test of agility with the ball, so it can be concluded that the school programme achieved the primary goals.

In the process of gathering data, testing of subjects, the persons for measuring and the coaches included in the work of the school, experienced certain difficulties in the realization of the tests. One of the main problems was the motivation of the younger age group in the tests that did not include the ball. This information shows the direction to go in the work with children younger than 8 years. So, the work content
should be adjusted to their needs and most of all to their mental abilities.

The value and importance of the monitoring the development of motor abilities with younger categories is in the prediction of players’ talents and in the projection of young players toward contemporary demands of the game of soccer. Monitoring the influence of certain developmental programmes and the adaptation of the subjects provides feedback to the work experts, in terms of training modification. According to the acquired results, in an exact way the existing programme can be assessed and, by removing possible shortcomings, work quality can be improved. It is necessary, according to the results of the tests, to create work programmes that will influence versatile development of the school attendants.

In the direction of future researches and the evaluation of the work of the soccer school, it is necessary to study the influence of specific, clearly defined programmes directed to the development of certain ability. In that way reasoned suggestions of certain work forms in some parts of training will be provided. Also, it is important to continue with the monitoring of the development of motor abilities of the tested attendants, so that we can in continuity notice certain growth and development patterns. If we consider the fact that the older age group is entering the period of stormy development, the acquired results will either confirm or shake past theoretical assumptions.

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