Multifunctional assessment of youth players' motor skills for follow-up

Abstract of the PhD thesis

David Zalai

Doctoral School of Sport Sciences
University of Physical Education

Supervisor:	Dr. Pál Hamar, professor, PhD
Official reviewers:	Dr. Tamás Szabó, director, CSc Dr. József Pucsok, professor, DSc
Head of the final Examination Committee:	Dr. Csaba Istvánfi, professor emeritus, CSc
Members of the final Examination Committee:	Dr. Péter Apor, professor, CSc Dr. Zsolt Radák, professor, DSc

Budapest
2016

1. INTRODUCTION

International level football success in the 21st century is unimaginable without a multidisciplinary, science-based background. In the past 15 years, the number of non-contact injuries and the physical demand on athletes to achieve increased dramatically. As a result of this the structured injury prevention and performance development have become an important issue. As a consequence of the increased physical requirements of the last couple of years, the objective tracing of players has become inevitable besides the subjective approach of coaches. A centrally determined and scientifically based test-system helps the athletes' long-term physical performance development process, the efficiency of the coaches' work, and it aids the multidisciplinary selection and talent-promotion sport model. According to sport experts a structured and professional youth program may help the Hungarian football to catch up with international standards. For that reason it is of utmost importance to study youth football players continuously with scientific methods. The aim of the research is a wide-range and comparative survey that examines the quality of the player's functional movement patterns, the levels of their motor skills, and their relations to specific age groups and positions.

2. AIMS

Based on the author's experience the currently used scientifically validated and objective methods, the physical testing, the pre-screening and motor performance test are not unified in Hungarian football.

It is supposed that the more comprehensive study is elaborated and the more abilities are tested with the help of methods most accepted by the international scientific literature, a better global view can be gained about the physical parameters of the Hungarian youth players that can give a wide-range support to talent selection and promotion in the long run. An extensive sport-specific scientific research should be an integrated part of youth training and of whole Hungarian football that examines players from physiological, condition, prevention and rehabilitation point of view as well.

Sport-specific surveys are different in youth training, the gained variables are not followed consistently, the special injury prevention and performance developing methods are not spread and the databases are not regularly used.

After studying the Hungarian selection system and the applying of protocols for testing performance it seems to be obvious that a centrally determined testing system supporting the selection and the efficiency of the process would be necessary to use. This way a football talent could be most probably selected, his improvement or fall back during the development process, or his position-specific adaptation could be detected with objective methods.

Based on these targets the study has built up the following aims:

1. Introduction of uniform and standardized test battery, which is the starting point for the player's long-term objective follow-up.
2. To support scout process and talent development.
3. Improve injury prevention and performance enhancement.
4. Comprehensive support of the football coach effectiveness.
5. Introduction of quality control system, to support the outline of cross section and longitudinally innovative methods.

Long-term aim:

6. Build-up benchmarks for different ages, positions, and skills. Based on findings further develop age and position-specific profiles.

During my research I have built up the following hypothesis:

1. The players in Under-18 and Under-21 age groups have a better main functional movement screen score than the players in age Under-16 and Under-17.
2. The wing defenders and wing midfielders have a higher functional asymmetries than the players in the middle position because the position-specific movement profile.
3. The main functional movement screen score is a predictor of the motor skills performance efficiency.
4. The Under-18 and Under-21 age group's performance will be better than the Under-16 and Under-17 age groups using the 30 meter linear sprint test.

5. In the agility tests, the wide midfielders and forwards will have the best performance.
6. In the endurance test, the central defenders will show the weakest performance. The midfielders will perform better than players in the forward position will.

3. MATERIAL AND METHODS

3.1. Participants

I have examined four different elite football academy: Under-16, Under-17, Under-18 and Under-21 (N=253) age groups in Hungary.

3.2. Methods

I have built up four phases to examine the players' functional movement quality and motor skills performance.

Body composition and anthropometry measurement

The height of the tested sample was measured with the standard stadiometer technique. The bio-impedance analysis (Inbody 230 Biospace Co.) was applied for measuring the body weight, the muscle mass and the fat percentage of the players. To examine the height a certified height chart was used. The measurement was carried out in the Frankfurt-horizontal head position. The body mass data was measured and recorded with 0,10 kg and the height with 0,10 cm precision.

3.2.1. Phase one

The 1st phase was concentrating on the injury potentials, risk factors and physical performance basic level (core performance, mobility, stability). I have used the following measurement methods:

Functional Movement Screen

I have evaluated various exercises (Deep squat, Hurdle step, Inline lunge, Shoulder mobility, Active straight leg raises, and Rotary stability) in the 0-3 scale. 3 points was scored if the person performed the movement correctly without any compensation. 2 points if the person performed the movement with compensation. 1 point if the person was unable to complete the movement, furthermore 0 point if pain occurred. The

players had 3 possibilities to perform all exercises and both sides. The participants with the seven FMS exercises performed maximum 21 points.

Y Balance Test

I have measured the player's performance from the 0 point base line. Directly located at the passive foot behind the base line and measured from this point the active leg performance by centimetres. The players performed the exercises in the following sequences: 1. Right anterior, 2. Left anterior, 3. Right posteromedial, 4. Left posteromedial, 5. Right posterolateral, 6. Left posterolateral.

Determination of the lower limb length

The length of the right lower limb was measured in centimetres from spina iliac anterior superior to the ankle bone.

3.2.2. Phase two

The 30-40 acceleration phases, change of directions, and frequency of jumping demands massive lower limbs strength and power from all players. Therefore, my 2nd phase was concentrating on the lower limb strength. I have used the following measurement method:

Standing long jump with arm swing

The players – in all case – executed the exercises in sports shoes in an upright starting position from two legs. They gained impetus by swinging the arms while lowering their centre of gravity and landed on both feet. During the testing process always the position of the heel was taken into consideration. The performance was measured with 1 cm precision with a certified tape.

3.2.3. Phase three

The multidimensional velocity, agility, acceleration, speed, and change of directions influenced the football player's performance effectiveness. Therefore, my 3rd phase was concentrating on the measurement of skills complex. I have used the following measurement methods:

30 metre linear sprint test

I have used the infrared photocell sensors (Fusion Sport Smartspeed, Australia) for performance measurement. The timing gates were positioned at the start line (0 metre) and 5, 10 and 30 metre at a height of 1 meter off the ground.

Arrowhead agility test, Illinois agility test, Zig Zag agility test

I have used the infrared photocell sensors (Fusion Sport Smartspeed, Australia) for the performance measurement. The timing gates were positioned at the start-finish line (0 metre) at a height of 1 meter off the ground.

In the tests of the third phase players started from the line 50 cm behind the starting line. The front leg was located exactly behind the given line. The players had to complete the test as fast as they could. During the statistical analysis the fastest performance, the best time was taken as a basis.

3.2.4. Phase four

In international level, football players must have adequate regeneration capacity between high intensity runs and high-level endurance skills. Therefore, my 4th phase was concentrating on these skills measurement. I have used the following measurement methods:

Yo-Yo Intermittent Recovery test - level 1

The players ran 20 meters in an increasing speed – to a recorded sound signal –, turned and ran back to the starting line. When they got back they had 10 seconds for an active recovery in the 5 meter area behind the line. The test was finished when the player couldn't keep up with the speed and with the given requirements in the protocol. First a "yellow card" was awarded as a warning. The second official warning given for not completing the distance meant the official end of the test. During the evaluation the completed and finished 2x20 m distances were used, while the 2x5 m distance of recovery was excluded.

Measure the maximal oxygen uptake (Vo2max)

I have used the related method of YYIR1 to estimate the Vo2max.

Yo-Yo Intermittent Recovery test - level 1: Vo2max (ml/min/kg) = YYIR1 distance (metre) x 0.0084 + 36.4

3.3. Statistical analysis

For data processing, the SPSS 21.0 Statistical Program was used, while descriptive statistics and analysis were applied to characterize the samples and determine the differences of age groups and positions respectively by ANOVA Fischer's LSD post-hoc and Hayters' correction method. For the age groups and positions homogeneity measurement the chi-square contingency table was used. The chi-square value is p=0,45, therefore the material is homogenous. To prove the relationship between motor skills performance, Pearson's correlation study was conducted. The significance level was set up p<0,05.

4. RESULTS

4.1. Results of the age-specific functional movement screen.

The age-specific results of the functional movement quality test showed that the poorest average FMS results was reached by age group U16 in relation to the total results of the seven different exercises of FMS. The U17 age group reached 14,30±1,99 FMS point, the U18 reached 14,96±1,73 and the U21 performance was 14,35±2,12 point. Based on this, the first hypothesis – that age group U18 and U21 have better FMSMS results than category U16 and U17 – has been verified.

4.2. Results of the position-specific functional movement asymmetries.

The results of determined asymmetries during the position-specific analysis of functional movement quality tests proved that they are the wide defenders (44%) and wide midfielders (36%) who have the highest percentage of functional asymmetry. According to this result the second hypothesis – that the wide defenders and the wide midfielders have higher asymmetry than the players in inside position–, has been verified.

4.3. Results of the functional movement screen main scores and the motor performance.

It can be stated from the results of the FMS and the motor skill survey that there was no significant correlation in the studied sample between the exercises of the functional movement pattern and the motor skills survey. As a consequence of it the third

hypothesis, – that FMSMS score is an indication for the efficiency of motor skills –, has not been verified.

4.4. Results of the sprint test performance.

The age group specific results of 30 m speed test proved that the best performance was reached by the U18 group, and the second was the U21 age group. Based on this, the fourth hypothesis, – that in the 30 m sprint tests U18 and U21 age groups will be better than the U16 and U17 ones –, has been verified.

4.5. Results of the position-specific agility performance.

The position-specific results of survey testing agility proved that not the results of wide midfielders, but that of the strikers was better compared to the rest of the players in other positions. So the fifth hypothesis, which stated that the results of wide midfielders and strikers in the agility tests will be better than the other players, has been partly verified.

4.6. Results of the endurance performance.

Position-specific endurance tests have proven that – considering the whole sample – the central defender achieved the 2nd best result at the YYIR1 test, only surpassed by the results of the central midfielders. Better results were found at central midfielders and wide midfielders than those playing at striker positions, which confirm the hypothesis. Based on this, the sixth hypothesis, – which states that in the endurance tests the central defenders performance will be the poorest, and midfielders will perform better compared to those at striker positions, has been partially verified.

5. CONCLUSIONS

The aim of this scientific research was to test the different abilities of the tested sample with such a complex standardized testing system that is widely accepted in the international literature and comprises of validated survey methods and that is missing from the Hungarian football.

As a result of the increased physical demands and number of non-contact injuries of the last couple of years, today it has become inevitable to follow the players' physical

performance, to help injury prevention and give a scientifically based quality control besides the subjective view of the coach.

Short-term aim:

1. Cross section establishment of current level of elite youth player's motor skills in various age groups by representative method.

Long-term aims:

2. Build up a comprehensive National test battery, to establish a scientific and evidence-based objective follow-up of players.
3. Build up a global database, to support the multidisciplinary scout process and talent development.
4. Long-term talent development process, performance innovation.

Furthermore, the aim was to describe future trends for coaches and specialists based on statistical analysis, and enable them to use a structured, long-term development plan, where the aim is to reach, maintain and support the individual's maximum performance, and to ensure continuous and wide-range injury prevention.

Results of the research confirmed that during a structured process it is inevitable to use a unified test system. In numerous cases non-optimal performance level and/or regressive processes were found in regard to either skills or age groups. The significant differences between the players playing positions related to the functional movement screen performance. These findings underlined the essential application of position-specific prevention programs in training of youth football players.

It is important to follow the current level of different skills in youth players with objective data during the developing process and the possible existing risk factors that could lead to an injury.

The completed tests of the sample have an important role: it covers the different abilities comprehensively and at the same time it reveals the specific data regarding different positions and age groups. Because of this the specific human biological, functional movement quality and motor skills of elite youth football players have been assessed.

The short conclusion of the research is that, as a consequence of extreme physical requirements modern football in the 21st century demands well-prepared and trained players, which means that modern players must be completely and systematically trained. To able to reach this the introduction of a unified test system in Hungarian football is necessary, which both in cross-sectional view and longitudinally identify and follow the current level of the given skills.

The longitudinal study and the data recording of different age groups and players in different positions will greatly support the complete training process, and will aid the work of coaches. The long-term following of youth players will open up the development of such new special methods, which are based on objective data. It would also support fitness coaches to develop the conditional and coordination abilities, the rehabilitation experts, the prevention strategy of physiotherapists, as well as the efficiency of the selection process to be in line with international standards.

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