

## PARTIAL AND GLOBAL QUANTITATIVE CHANGES OF MOTOR ABILITIES IN FOOTBALL PLAYERS 14 TO 16 YEARS OF AGE

Osman Bajrić

Faculty of kinesiology, University of Travnik, Bosnia & Herzegovina

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### Abstract

*This research work was carried out on the sample group of 137 football players, 14 to 16 years of age from football clubs in the area of Central Bosnian Canton. The research applies a set of 15 tests of motor abilities, which determine velocity, explosive and repetitive strength, coordination and flexibility. The basic aim of the research was to determine the partial and general quantitative changes that developed as a result of programmed training activities over a period of six months. The analysis of possible changes (differences) between the initial and final measurements of motor abilities has been performed using T-test for dependent sample and discriminative analysis. On the basis of obtained values of the T-test it has been established that significant positive changes (partial transformational quantitative effects) in all the variables applied in the field of motor abilities developed as a result of the applied programmed training activities. On the basis of obtained values of discriminative analysis it has been established that there occurred statistically significant general quantitative changes in the field of motor abilities; the most important refer to repetitive strength, flexibility and segmental velocity of lower extremities. On the basis of obtained values of the T-test for the dependent samples and the values of discriminative analysis it can be concluded that statistically significant positive changes (partial and general quantitative transformational effects) in all the variables of motor abilities developed as a result of the applied programmed training activities.*

**Key words:** motor abilities, football program, T-test, discriminative analysis.

### Introduction

Recently, the development of new training technologies has become quite visible, especially in the segment of work with the younger selections of football players. New training technology means the development of such training programs which will completely be adjusted to the age characteristics and individual abilities of every individual and as such contribute to the finest development of all characteristics and abilities which define anthropological status of an individual through all phases of his development. The existing researches have shown that human abilities and characteristics develop most effectively when the dynamic of training process concurs with the dynamic of natural development of certain characteristics and abilities. Thus, a quiet number of researchers agree with this statement (Blažević, 1997, Matvejev, 2000, Malacko 2002, Mikić 1991, Višnjic and associates. 2004), who furthermore emphasise that those are the periods of ontogenesis when, based on the natural laws, actualizes the most important dynamics of development of certain characteristics and abilities of every individual as well as the period of creating appropriate

presumptions for the formation of certain motor skills. For that reason, in the process of training program with the younger selections of football players effective procedures should be followed which help in defining the choice, dosage and distribution of training operators during the workout as well as the recovery measure during the cessation phase. Thus, by following this approach in programming training procedures it is possible to expect positive transformational effects.

The effects of training transformational processes of motor abilities have been the subject matter of recent researches: (Hadžikadunić, 2000, Talović, 2001, Stanković, 2002, Bašinac, 2002, Skender, 2004, Tabaković, Turković, Skender, 2005). In most of those researches significant partial and global quantitative changes have been established in tests of motor abilities under the influence of certain programs. In this particular research especially defined football program has been tested which lasted for six months consisting of 72 training units. The basic aim of this research was to establish partial and global quantitative changes of motor abilities originated under the influence of football program applied.

## **Methods**

### *Samples*

In this research a sample population consists of 137 football players 14 – 16 years of age from the area of Central Bosnian canton. They are all registered members of the following cadet clubs: NK "Travnik" – Travnik, NK "Vlašić" – Turbe, NK "Iskra" – Bugojno, NK "Radnik" - Donji Vakuf, FK "Vitez" – Vitez, NK "Vitez" – Vitez, NK "Novi Travnik" Novi Travnik, NK "Lašva" - Dolac n/L (Travnik). The whole sample group has undertaken a medical check up and they were all clinically healthy and without distinctive morphologic and loco motor damages.

### *Variable*

For the assessment of motor abilities tests are used to measure the following: explosive strength, velocity, repetitive strength, coordination and flexibility. All the above mentioned motor abilities are tested with three tests which are standardized and available in publications. Explosive strength (Standing jump – MFESDM, Vertical jump - MFESVM, Standing long jump – MFETRO), Velocity (Leg tap – MBFTAN, Leg tap against the wall – MBFTAZ, 20 m sprint high start - MFE20V), Coordination (Leg slalom with two balls – MKLSNL, Sideway steps – MAGKUS, "Envelope" test – running in the rectangular – MAGTUP), Repetitive strength (Pushups – MRESKL, Lifting the body from laying position for 30" – MRCDTZ, Crotchety – MRSCUC), Flexibility (Forward bend on the bench – MFLPRK, Step out – MFLBOR, Split lying on the back – MFLPLU).

### *Methods of data analysis*

To establish partial quantitative changes (differences) for each variable used, T- test has been used to assess the changes for dependent variable which appeared in between two time points (during the initial and final measurement). To establish global quantitative changes (differences) that originated in between two time points (during initial and final measurement) the discriminative analysis has been performed.

## **Results and discussion**

Analyzing the results of T-test in the field of motor tests it could be noticed that the results of arithmetic median (Mean) in final

measurement are improved compared to the initial measurement, at each variable used to assess motor abilities. Based on the result of arithmetic median (Mean) in the beginning and at the end of realization of football program as well as significance and changes of (p) tested (T-test) it could be noticed that football program applied has initiated partial changes (effects) at each variable used, while the values of (T-test) have been significant at the level  $p=0,01$ . Analyzing the values of arithmetic median (Mean) in initial and final measurement we could notice that the greatest improvement of the results in final measurement occurred at following tests of motor abilities: MFETRO, MFESDM, MFESVM, tests that measure explosive strength; MKLSNL, MAGKUS, tests of coordination and flexibility tests: MFLPRK, MFLPLU. Further analysis of significant changes (p) tested (T-test) we can notice that at each test of motor abilities where improvements are visible in final measurement of values of arithmetic median (Mean) certain statistical changes occurred, i.e., they reached the values of statistical significance (p). Thus, all variables of motor abilities, tested with T-test, reached the coefficient of statistical significance (p), showing that significant statistical partial changes occurred in all variables. Based on the obtained parameters it could be stated that significant changes have been attained (partial quantitative transformational effects) in all variables in the field of motor abilities, as a result of football program applied. Based on the results mentioned in table (1) the changes have been analyzed between initial and final measurement of quantitative effects of football program in the field of motor abilities. Analysis of the results in table (1) shows us that one statistically significant discriminative function has been obtained whose coefficient of canon correlation is  $R_c=51$ , which indicates the correlation of gathered data based on which we have performed the discriminative analysis and gained results of discriminative function. To assess the efficiency of football program applied in the beginning and at the end of the program 15 tests have been performed which are considered to be valid for the evaluation of motor space. Reviewing the results in table (1) it could be noticed that the greatest contribution to discriminative analysis gives the test that measure explosive strength (MFESDM), test of repetitive strength (MRESKL), segment velocity (MBFTAN), and the flexibility test (MFLPLU). Based on the correlations of discriminative function (the

structure of discriminative function), i.e. the variable that differentiates between initial and final measurement, it could be noticed that the test for the evaluation of repetitive strength (MRESKL) is responsible for the changes obtained, and it is followed by test for the assessment of flexibility (MFLPLU), segment velocity of lower extremities (MBFTAN), coordination (MKLSNL), explosive strength (MFETRO, MFESVM), and tests of repetitive strength (MRCDTZ, MRSCUC).

The above mentioned motor tests have influenced the obtained effects caused by football program applied. Based on the presented results we can state that the football program with its structure which is based on situation training module with distended exercises has produced positive results in the increase of repetitive strength, and then flexibility and segment velocity of lower extremities. Also, significant global quantitative changes have occurred in tests of repetitive strength, flexibility and segment velocity. Test for the evaluation of running speed (MFE20V), which in this sample group is mostly dependent on genetic code, does not produce significant quantitative changes, and from that we can deduce two conclusions: a) recent researches indicate that motor abilities are mostly depended on genetic code, so it leaves a little chance for such changes to occur, and b) the structure of the program applied was not prepared in such way to cause significant changes in this motor ability.

Also, a different position of tests can be noticed on discriminative functions between (MFLPLU) and (MFLBOR), which hypothetically belong to the same ability – flexibility. Better position of (MFLPLU) test on discriminative function can be ascribed to bigger number of motor activities within the program structure which caused motor activities similar to. Global quantitative changes of some variables in motor space are the result of significant increase of efficiency in a number of body abilities, especially of increased number of specific motor information within the time limit of football program.

Table 1. The results of discriminative analysis of motor abilities

Eigenvalue	Canonical R
0.342	0.505

Wilks' Lambda	Chi-square	df	Sig.
0.745	77.770	15	0.000

Table 2. Structure of discriminant function

	Function 1
MFESDM	-.538
MFESVM	.163
MFETRO	.340
MBFTAN	.408
MBFTAZ	-.098
MFE20V	.227
MKLSNL	-.392
MAGKUS	-.247
MAGTUP	.150
MRESKL	.416
MRCDTZ	.327
MRSCUC	.127
MFLPRK	.115
MFLBOR	.111
MFLPLU	.441

Table 3. Group centroids

VAR00001	Function 1
2	1
1,00	-.583
2,00	.583

### Conclusion

The establishing of partial global and motor quantitative changes (differences), applied motor abilities of football players 14-16 years of age from the area of Central Bosnian canton, after the realization of specially defined football program which lasted for six months, was the basic aim of this research.

Based on the results of T-tests for dependent samples and results of discriminant analysis it is possible to conclude that after the realization of specially defined football program which lasted for six months, we have reached statistically significant quantitative changes (differences) in the field of motor abilities.

The obtained results can be used by football trainers in constructing similar programs and their implementation in everyday football practice.

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Correspondence to:

Osman Bajrić, PhD.

University of Travnik

Faculty of kinesiology

Aleja konzula 5, 72270 Travnik, BiH

Phone: +387(0)61 790 594

E-mail: bajric\_osmo@yahoo.com

## PARCIJALNE I GLOBALNE KVANTITATIVNE PROMJENE MOTORIČKIH SPOSOBNOSTI NOGOMETAŠA UZRASTA 14 DO 16 GODINA

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### **Sažetak**

Istraživanje je provedeno na uzorku od 137 nogometaša uzrasta 14 do 16 godina iz nogometnih klubova Srednjobosanskog kantona. U istraživanju je primijenjen skup testova motoričkih sposobnosti za procjenu eksplozivne snage, brzine, repetitivne snage, koordinacije i fleksibilnosti. Osnovni cilj istraživanja bio je da se utvrde parcijalne i globalne kvantitativne promjene (razlike) motoričkih sposobnosti nastalih pod uticajem programiranog trenažnog rada. Za analizu eventualnih promjena (razlika) između inicijalnog i finalnog mjerenja motoričkih sposobnosti primijenjen je T-test za zavisne uzorke i diskriminativna analiza. Na osnovu dobijenih parametara testiranih T-testom utvrđeno je da su dobijene značajne pozitivne promjene (parcijalni transformacioni kvantitativni efekti) kod svih primijenjenih varijabli u prostoru motoričkih sposobnosti, kao rezultat primijenjenog programa nogometa. Na osnovu dobijenih rezultata diskriminativne analize utvrđeno je da je došlo do statistički značajnih globalnih kvantitativnih promjena u prostoru motoričkih sposobnosti, a najznačajnije promjene su se desile u testovima repetitivne snage, fleksibilnosti i segmentarne brzine donjih ekstremiteta. Na osnovu rezultata T-testa za zavisne uzorke i rezultata diskriminativne analize može se zaključiti da su utvrđene statistički značajne pozitivne promjene (parcijalni i globalni kvantitativni transformacioni efekti) kod svih varijabli motoričkih sposobnosti kao rezultat primijenjenog programa nogometa.

**Ključne riječi:** motoričke sposobnosti, program nogometa, T-test, diskriminativna analiza

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