Coll. Antropol. **32** (2008) 1: 241–247
Original scientific paper

The Impact of Football Training on Motor Development in Male Children

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A B S T R A C T

The aim of the study was to determine the effect of football school program and physical education curriculum on changes in the motor abilities of 7- and 8-year-old boys. The study included a sample of 180 boys divided into group 1 (7-year-old boys), subdivided to experimental (n=40) and control (n=50) groups, and group 2 (8-year-old boys), subdivided to experimental (n=40) and control (n=50) groups. Experimental groups included children attending three training units of football training over a 9-month period, in addition to the conventional physical education curriculum. Control groups included children attending only conventional physical education curriculum. All study subjects underwent testing with a battery of 12 motor tests at the beginning and at the end of the study. Results obtained by discriminative canonic analysis showed no statistically significant between-group difference in motor abilities at the beginning of the study. However, significant differences in favor of experimental groups were recorded at the end of the study. Favorable changes in all motor variables were observed in both experimental and control groups of children from the initial through the final state. These changes were more pronounced in experimental groups. Analysis of variance for difference variables (final to initial measurement) indicated programmed education in the form of football training in addition to regular physical education curriculum to predominantly influence the development of aerobic endurance, agility, speed and flexibility in 7-year-old boys, and of explosive strength, aerobic endurance, flexibility and speed in 8-year-old boys. In the latter, football training led to the formation of a motor complex integrating explosiveness, speed, coordination, endurance and flexibility as a general motor factor determining future quality development in football.

***Key words**: football, motoricity, boys, transformational process*

Introduction

The development of motor abilities is in part determined by genotype (genetic structure inherited from parents), and is greatly influenced by transformational kinesiologic processes. The right ratio of the innate and the acquired in particular motor abilities poses constant challenge to sports coaches and scientists. Natural movements or biotic motor skills are used from the youngest age to reach the set goals. These motor programs enable human beings to efficiently master the space and various types of obstacles, and to successfully manipulate various objects. In young elementary school children, motor abilities are homogeneously and continuously improved in the function of age and sex. As early as preschool age, these abilities are characterized by gradual neuromuscular maturation and development of basic models of movement (walking, running, jumping). Once these basic movement structures have been properly acquired (about age 6), besides the child's developmental characteristics, the role of physical activity gains importance as a significant factor influencing the development of motor abilities[1–3]. From age 6 to 8, most neural structures have reached a nearly adult stage, while basic motor abilities have properly developed, thus providing preconditions for differentiation of latent motor dimensions. Motor development is predominated by the formation of two mechanisms responsible for motor efficiency, i.e. the mechanism of energy regulation and the mechanism of movement structuring manifestation. The former is mostly responsible for the energy component, and the latter for the information component of movement[4,5].

The best effects of training with target development of motor abilities are recorded at a younger school age,

Received for publication December 31, 2007

while developmental status, i.e. biological maturity, exerts considerable impact on motor performance[6]. At a younger school age, agility, psychomotor coordination, rhythm, equilibrium, flexibility and aerobic endurance can be considerably influenced upon, thus kinesiologic operators should preferably address these abilities[7–9].

The effect of specially programmed physical education on motor development in elementary school first-graders was investigated by Babin et al. (2001)[9] in a sample of 633 children. The children were divided into control group attending standard physical education curriculum and experimental group attending specially programmed physical education. A battery of 12 motoricity tests was used at the beginning and at the end of the 9-month study period. Analysis of changes (using the model of differences) pointed to significantly greater quantitative changes in the experimental group as compared with the control group of children. In male first-graders, changes were recorded in the tests of aerobic endurance, static strength, flexibility, speed, explosive strength (of running and throwing type), and equilibrium. Results of this study suggest that at this age, more pronounced and more complex transformational effects on the relevant basic motor abilities are obtained by use of variable kinesiologic contents.

According to the criterion of structural complexity, football belongs to a group of polystructural complex sports. In football, the level of performance depends on the complex of anthropologic features and specific ability of the player to manage the system and game concept, the game rate and rhythm, and his own bioenergy capacity and functional states during the game (Gabrijelić, 1972)[10]. Hierarchic structure of football performance contains three groups of factors[11]. The first group of factors includes basic anthropologic features, i.e. health status, morphological characteristics, basic functional abilities, basic motor abilities, intellectual abilities, and personality. The second group of factors includes specific abilities and skills of the player, i.e. technical abilities, specific motor abilities, tactical abilities and skills, theoretical knowledge, and characteristics relevant for micro-social adaptation. The third level includes situation efficiency and contest results. Motor and functional abilities are of utmost importance. Motor abilities refer to endurance, speed, strength, coordination, precision and flexibility, which are underlain by the efficiency of organ system, neuromuscular system in particular, as it is responsible for the intensity, duration and regulation of movement. Functional abilities imply energy transport through the body. This system depends on the function of the respiratory, cardiovascular, endocrine, nervous and other organ systems.

Currently, elite football requires strong and tough athletes with superior motor and functional abilities (speed, explosive strength, aerobic and anaerobic capacity, coordination), and sense of improvising and collective game. In football, performance also depends on how well particular characteristics of individual players fit in the whole to make a coherent team.

Hansen et al. (1999)[12] carried out a study in 98 football players aged 11, divided according to their characteristics into two groups: elite players and beginners. Growth and development changes were monitored during a two-year period, while strength and endurance were assessed by isokinetic dynamometric exercise testing. The measurements included extension of both lower extremities and each lower extremity, strength of dorsal and abdominal muscles, and hand force. The level of testosterone was also determined. Analysis of variance for repeat measurements showed the elite players to have achieved significantly better results than the beginners in all the parameters measured. This study pointed to the major role of testosterone in the development of strength in young football players. The young elite players with a higher testosterone level developed significantly greater strength and endurance than their non-elite counterparts.

Malina et al. (2000)[13] investigated growth and maturation in a group of 135 elite Portuguese football players aged 10.7 to 16.5 years, divided into three subgroups according to the level and length of football training, and to the biologic and chronologic parameters of late, intermediate and early maturation. Results of this comparative analysis suggested that football ruled out late maturation while favoring intermediate or early maturation in young football players.

Investigating the impact of pliometric training on motor abilities, Diallo et al. (2001)[14] concluded that significant favorable changes in the motor space of football players could be achieved in a relatively short time with properly planned and programmed training.

Similarly, Helgerud et al. (2001)[15] also report on a significant effect of programmed interval endurance training on functional abilities (increase in maximal oxygen input and lactate threshold) and football performance in young football players. The favorable impact of interval endurance training on physiologic characteristics was also recorded in elite football players (McMillan et al., 2005)[16].

Investigating relations of the growth, maturation and functional capacity in a group of 69 young football players, Malina et al. (2004)[17] found the level of biologic maturation to significantly influence functional capacity in football players aged 13–15. Football training contributed substantially to the development of aerobic endurance, while body height and body weight contributed significantly to the development of speed and explosive strength.

Results of the studies reported to date point to extremely great possibilities and modes of influencing the health and abilities in young children. The development of these abilities may greatly vary; therefore, systematic and controlled kinesiologic activities aimed at upgrading all body functions are of utmost importance[8,9,18]. Inadequate frequency of physical activity and relatively inert environment result in rather modest support to the child's growth and development in general, and the po-

tential failures occurring at that age usually prove irreparable.

The main issue of interest in the present study was analysis of changes in motor abilities of elementary school first- and second-graders as influenced by the conventional physical education curriculum and special football training program. The aim of the study was to assess the effect of the special football training program and physical education on changes in motor abilities of elementary school first- and second-graders, as determined at two time points.

Subjects and Methods

Subjects

A group of 180 boys, Split elementary school first- and second-graders, chronologic age 7 and 8 years, were included in the study. Study sample was divided into group 1 of 7-year-old children, subdivided into experimental (n=40) and control (n=50) groups; and group 2 of 8-year-old children, subdivided into experimental (n=40) and control (n=50) groups. Both experimental groups included children attending three football school training units (45 min) *per* week for nine months, in addition to conventional physical education curriculum. Control groups attended exclusively conventional physical education curriculum. Experimental groups consisted of male children from four Split downtown elementary schools. Only clinically healthy children that were not included in any other extra-curricular activities were included in the study.

Experimental groups attended special training program led by an expert group of the same coaches (professors of kinesiology) and took active part in at least 80% of training activities along with standard physical education curriculum. The teachers were instructed to perform physical education for control group children according to the first- and second-grade curriculum. Only children attending at least 80% of physical education activities were included in the study.

In experimental groups, programming of activities was primarily focused on acquiring necessary knowledge and experience in active playing. Free playing was gradually steered towards the real game demands. On teaching and learning techniques, the first requirement was that the motion and movements be properly and softly performed, in order to acquire correct and rational technique through the process of teaching and training. The process of technique teaching and training was predominated by basic or central technical elements, i.e. kicking, receiving and taking the ball away, tending to introduce as much as possible situation exercise in technical preparation, thus to ensure conditions similar to football game conditions.

The synthetic method of learning was mostly used, with the analytical method introduced as needed. A combined and situation method of exercise was employed in later stage of learning particular technical elements, always taking individual child's progress in consideration. Concerning the mode of load distribution, interval method with variable load distribution was most commonly used. The interval method of training with standard load was employed as needed, as dictated by the specific training tasks. The load volume increased on each training unit, so designed as to first repeat the information given in the preceding lesson, followed by learning the items deriving from the motor information acquired. In this way, the ratio of energy load increased from lesson to lesson, following the rising level of motor skills. Some parts of elementary technique and tactics were repeated successively on several occasions, while increasing the acquired segments and the volume of work. Accordingly, the load increased continuously, and progressive discontinuity was achieved by inserting educational units with a more pronounced information component.

Variables

A battery of 12 standard motor measuring instruments was chosen for assessment of basic motor dimensions[2–4,7–9,19,20]. The following motor tests were used: coordination (side steps and polygon backward); flexibility (forward bow and shoulder dislocation); movement frequency (hand tapping and foot tapping); explosive strength (standing long jump, standing ball throw and high start sprint 20 m); repetitive strength (sit-ups – supine trunk lift with knees bent); static strength (bent arm hang); and aerobic endurance (3-min run).

Statistics

Statistica for Windows Version 5.5 was used on statistical data analysis. The analysis included basic statistical parameters of arithmetic mean and standard deviation (mean ± SD) of all study variables in experimental and control groups of subjects. Differences between control and experimental groups at initial and final measurement were determined by use of discriminative canonic analysis (DF, CanR). Then, univariate analysis of variance of between-group differences in the mean values from initial to final measurement of motor variables was performed.

Results

Comparison of the basic statistical parameters of the study variables (mean ± SD) indicated significant changes to have occurred during the time elapsed from initial to final measurement in all variables of motor abilities in both control and experimental groups of study subjects (data on 7- and 8-year-old boys are shown in Tables 1 and 2, respectively). However, in all tests used for motor ability assessment, the progress was by far more pronounced in experimental groups, as expected because these individuals attended three training units weekly in addition to their standard physical education curriculum.

Multivariate differences between the control and experimental groups of children, determined by canonic discriminative analysis (DF, CanR) on initial and final

TABLE 1
RESULTS OF DISCRIMINATIVE ANALYSIS OF MOTOR VARIABLES ON INITIAL AND FINAL MEASUREMENT BETWEEN CONTROL AND EXPERIMENTAL GROUP OF 7-YEAR-OLD BOYS

Variable	Initial measurement			Final measurement		
	Control	Exp	DF	Control	Exp	DF
SIDESTEP#	13.79±1.76	13.69±1.67	0.13	13.54±2.01	11.76±1.23	–0.47
POLYGON#	17.01±2.86	16.99±3.74	0.02	15.11±3.14	13.81±3.27	–0.18
FORWARD	38.18±8.80	39.17±4.30	–0.32	43.24±7.36	50.08±6.90	0.44
SH-FLEX#	54.27±8.03	53.82±12.09	0.10	49.34±6.42	42.07±11.21	–0.38
HANDTAP	20.29±2.08	20.71±2.84	–0.45	22.59±1.72	25.57±3.14	0.57
FOOTTAP	25.64±1.46	26.28±2.75	–0.73	28.58±1.66	32.02±3.16	0.66
L-JUMP	121.06±17.3	123.50±15.8	–0.35	132.23±15.4	135.48±12.9	0.10
THROW	11.84±3.36	11.99±2.78	–0.11	14.17±3.56	15.54±3.09	0.18
20M#	4.74±0.43	4.66±0.45	0.43	4.48±0.29	4.24±0.39	–0.19
SIT-UP	24.63±7.69	25.72±6.52	–0.36	29.07±6.02	32.00±5.55	0.23
BENTARM	14.00±7.85	14.39±11.22	–0.10	19.37±11.31	24.24±18.88	0.15
3MINRUN	503.96±65.8	513.62±75.4	–0.33	521.40±70.4	622.57±80.2	0.62
Centroids	0.17	–0.24		–0.88	1.26	
CanR			0.20			0.73*

Control – control group; Exp – experimental group; DF – structure of discriminative function; CanR – coefficient of canonic discrimination; #variable with opposite metric orientation, *p<0.001;
SIDESTEP – sidesteps, POLYGON – polygon backwards, FORWARD – forward bow, SH-FLEX – shoulder flexibility, HANDTAP – hand tapping, FOOTTAP – foot tapping, L-JUMP – long jump, THROW – ball throwing, 20M – 20-m run, SIT-UP – sit- ups, BENTARM – bent arm hang, 3MINRUN – 3-min run

TABLE 2
RESULTS OF DISCRIMINATIVE ANALYSIS OF MOTOR VARIABLES ON INITIAL AND FINAL MEASUREMENT BETWEEN CONTROL AND EXPERIMENTAL GROUP OF 8-YEAR-OLD BOYS

Variable	Initial measurement			Final measurement		
	Control	Exp	DF	Control	Exp	DF
SIDESTEP#	13.88±1.68	13.55±1.28	–0.28	12.16±1.39	11.09±0.95	0.42
POLYGON#	18.09±5.56	16.01±2.49	–0.58	16.86±4.29	12.53±2.00	0.58
FORWARD	44.14±8.59	45.56±8.66	0.21	46.94±8.65	54.76±7.56	–0.46
SH-FLEX#	54.56±8.33	52.12±12.41	–0.32	49.81±6.95	43.07±9.69	0.41
HANDTAP	20.96±2.60	22.60±3.22	0.76	22.70±2.21	25.71±3.86	–0.50
FOOTTAP	24.44±1.79	25.63±2.87	0.69	26.52±1.99	29.54±3.09	–0.60
L-JUMP	123.66±17.5	124.76±13.4	0.08	126.39±17.6	140.49±12.5	–0.43
THROW	13.06±2.88	13.24±3.62	0.07	14.29±3.10	17.25±3.83	–0.43
20M#	4.74±0.37	4.64±0.37	–0.38	4.54±0.34	4.07±0.32	0.69
SIT-UP	24.97±5.25	26.06±6.27	0.25	27.72±6.01	31.14±6.27	–0.27
BENTARM	11.39±10.99	14.30±11.49	0.34	19.08±9.20	27.41±17.52	–0.32
3MINRUN	522.04±54.5	539.13±70.14	0.37	544.63±62.89	619.75±73.9	–0.55
Centroids	–0.27	0.49		0.73	–1.31	
CanR			0.34			0.70*

Control – control group; Exp – experimental group; DF – structure of discriminative function; CanR – coefficient of canonic discrimination; #variable with opposite metric orientation, *p<0.001;
SIDESTEP – sidesteps, POLYGON – polygon backwards, FORWARD – forward bow, SH-FLEX – shoulder flexibility (maximal both-arm circumduction in shoulder joints), HANDTAP – hand tapping, FOOTTAP – foot tapping, L-JUMP – long jump (standing jump), THROW – ball throwing, 20M – 20-m run, SIT-UP – sit-ups, BENTARM – bent arm hang, 3MINRUN – 3-min run

measurement in 7- and 8-year-old boys are also presented in Tables 1 and 2, respectively.

In 7-year-old children (Table 1), results of discriminative analysis showed no significant motor space difference between the control and experimental group on initial measurement. It should only be noted that the position of group centroids defined experimental group as the one with slightly better results in all tests on initial measurement.

Analysis of the results obtained on final measurement yielded a statistically significant discriminative function ($p<0.001$) with canonic coefficient of correlation (CanR= 0.73). The position of group centroids defined experimental group as the one with superior results in all tests on final measurement. Accordingly, the 9-month football training had favorable effect on changes of all motor abilities in 7-year-old boys, movement frequency, aerobic endurance, agility and flexibility in particular.

In 8-year-old children (Table 2), results of discriminative analysis yielded no significant differences in motor abilities between the control and experimental group on initial measurement. On final measurement, however, numerical indicators of between-group differences in motor abilities pointed to the formation of a significant discriminative function. On final measurement, canonic correlation (CanR) of 0.70 at the level of significance $p<0.001$ was recorded. The position of group centroids defined experimental groups as the one with superior results in all study tests on final measurement. Thus, the 9-month football training predominantly influenced motor abilities in the experimental group of 8-year-old boys, i.e. explosive strength, upper and lower extremity movement frequency, coordination in mastering complex motor tasks, aerobic endurance and flexibility.

Univariate differences in motor changes between the experimental and control groups of 7- and 8-year-old boys are presented in Table 3. Differences in the mean values of results recorded on initial and final measurement were calculated for both groups. The level of difference significance was tested by use of univariate analysis of variance.

Data presented in Tables 1 and 2 indicate significant improvement of all motor tests to have occurred during the 9-month period in both 7- and 8-year-old boys. Data shown in Table 3, however, suggest that improvement in the tests of aerobic endurance, agility, speed, movement frequency and flexibility to be significantly greater in the experimental group of 7-year-old boys as compared with their control group counterparts. Table 3 data reveal that a significantly greater improvement in all motor tests was also recorded in the experimental group of 8-year-old boys as compared to their control group counterparts, in particular in the tests for assessment of explosive strength, aerobic endurance, flexibility and movement frequency. Besides growth and development, this obvious progress was definitely influenced by additional physical exercise in the form of football training.

Discussion

The present study was so designed as to provide data on two fundamental items: identification of basic motor abilities to determine primary selection in football in 7- and 8-year-old boys, and assessment of the impact of football training (in the form of football school) on the development of basic motor abilities in these children.

TABLE 3
UNIVARIATE DIFFERENCES IN MOTOR CHANGES (FINAL – INITIAL MEASUREMENT) BETWEEN CONTROL AND EXPERIMENTAL GROUPS OF 7- AND 8-YEAR-OLD BOYS

Variable	7-year-old			8-year-old		
	x2–x1	x2–x1	F-test	x2–x1	x2–x1	F-test
	Control	Exp		Contro	Exp	
Sidesteps# (s)	–0.25	–1.93	61.17^{c}	–1.71	–2.46	8.87^{b}
Polygon backwards# (s)	–1.90	–3.17	8.75^{b}	–1.24	–3.48	6.65^{a}
Forward bow (cm)	5.06	10.90	13.96^{c}	2.80	9.20	37.75^{c}
Shoulder flexibility # (cm)	–4.92	–11.74	31.99^{c}	–4.74	–9.05	11.99^{c}
Hand tapping (f)	2.30	4.86	29.02^{c}	1.74	3.11	13.49^{c}
Foot tapping (f)	2.94	5.74	45.29^{c}	2.07	3.91	28.70^{c}
Standing jump (cm)	11.17	11.97	0.06	2.73	15.74	40.75^{c}
Ball throwing (m)	2.33	3.54	4.65^{a}	1.24	4.01	52.82^{c}
20-m run# (s)	–0.35	–0.42	1.12	–0.19	–0.57	46.69^{c}
Sit-ups (*per* min)	4.43	6.27	4.31^{a}	2.75	5.08	8.08^{b}
Bent arm hang (s)	5.36	9.84	3.06	7.68	13.11	5.26^{a}
3-min run (m)	17.43	108.95	176.44^{c}	22.58	80.63	42.18^{c}

Control – control group; Exp – experimental group; x2–x1 – arithmetic mean differences between final and initial measurement; F-test – univariate test of differences; #variable with opposite metric orientation, $^{a}p<0.05$, $^{b}p<0.01$, $^{c}p<0.001$

Although differences recorded between experimental and control groups of children on initial measurement were not statistically significant, they were present and ascribed to natural selection, i.e. the boys chose the extra-curricular sports activity that was consistent with their anthropologic characteristics, in this case motor abilities. On initial measurement, the 7-year-old boys attending additional extra-curricular football training had slightly better results in the tests of speed and leg explosiveness, repetitive trunk strength, aerobic endurance and trunk flexibility, in comparison with their peers attending only conventional physical education without additional training. Differences recorded on initial measurement between the experimental and control groups of 8-year-old boys were even greater in the tests of speed, whole body coordination, explosive strength of running type (sprint) and aerobic endurance. The above data suggested that inclusion in football training was limited by motor abilities of speed and explosive strength of running type in 7-year-old boys, and by speed, coordination and explosive strength of running type in 8-year-old boys. The between-group differences recorded on initial measurement were accumulated, i.e. integrated with the changes induced by football training, which in turn led to the formation of discriminative functions on final measurement.

In 7-year-old boys, discriminative function determined after 9-month training differentiated experimental and control group according to general motor efficiency underlain by speed regulation, aerobic endurance and muscle tone regulation. According to general motor efficiency thus defined, the experimental group subjects showed superior performance.

In 8-year-old boys, discriminative function determined on final measurement formed a motor complex integrating almost all relevant basic motor abilities responsible for general motor efficiency in football. General motor efficiency was determined by force regulation, speed regulation, mechanisms of cortical movement regulation, aerobic endurance and muscle tone regulation[4,5].

Accordingly, in 7-year-old boys the development of football sports quality proceeded in parallel with the development of psychomotor speed and aerobic endurance, and with the development of muscle tone regulation (flexibility), indicating that primary selection of boys for football training should rely on these abilities.

In 8-year-old boys, the next stage of the football sports quality set in, continuing the previous one, and was characterized by marked development of explosive strength and coordination in the form of solving complex motor tasks. This means that the number of predictors determining football sports quality increased, and along with it the number of motor abilities upon which selection should be based at this stage.

Based on the results presented (Table 3), it is concluded that changes induced by football training and recorded between the measurements, being significantly more pronounced in experimental groups as compared with control groups of study children, were more responsible for the formation of discriminative functions on final measurement (Tables 1 and 2). In 7-year-old children, they included development of aerobic endurance, agility, movement frequency and flexibility, and in 8-year-old children development of explosive strength, aerobic endurance, flexibility and movement frequency. Great between-group differences were recorded in both groups in the variable assessing aerobic endurance, thus confirming the hypothesis on changes in the oxygen transport system and extraction of muscle work metabolites to be predominant and desirable, as also demonstrated in previous studies[8,9,21,22].

Acknowledgements

This research is a part of a project of the Ministry of Science, Education and Sport of the Republic of Croatia (No: 0177190 head researcher: Prof. R. Katić).

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UTJECAJ NOGOMETNOG TRENINGA NA MOTORIČKI RAZVOJ DJEČAKA

S A Ž E T A K

Ovo istraživanje provedeno je s ciljem utvrđivanja učinkovitosti programa nogometne škole, te nastave tjelesne i zdravstvene kulture (TZK) na promjene motoričkih sposobnosti sedmogodišnjih i osmogodišnjih dječaka. Istraživanje je provedeno na uzorku od 180 dječaka, podijeljenih u dvije podskupine: prva grupa – sedmogodišnji dječaci, podijeljena je na eksperimentalnu (N=40) i kontrolnu (N=50) skupinu, a druga – osmogodišnji dječaci, također je podijeljena na eksperimentalnu (N=40) i kontrolnu (N=50) skupinu. Eksperimentalne skupine dječaka sačinjavali su ispitanici koji su osim redovite nastave tjelesne i zdravstvene kulture (TZK), tijekom tjedna bili tretirani i s tri trenažne jedinice dodatnog tretmana škole nogometa u trajanju od devet mjeseci. Kontrolne skupine sačinjavali su ispitanici koji su pohađali samo redovitu nastavu tjelesne i zdravstvene kulture (TZK). Na početku i na kraju eksperimenta svi su ispitanici izmjereni baterijom od 12 motoričkih testova. Rezultati diskriminativne kanoničke analize su pokazali kako nije bilo značajnih razlika u motoričkim sposobnostima između grupa na početku eksperimenta, dok su te razlike bile značajno izražene u finalnom stanju u korist eksperimentalnih skupina. U svim primjenjenim motoričkim varijablama od inicijalnog do finalnog stanja, kako za kontrolne tako i za eksperimentalne skupine ispitanika, došlo je do promjena pozitivnog smjera. Promjene su značajno više izražene kod eksperimentalnih grupa ispitanika. Analiza varijance nad varijablama razlika (finalno – inicijalno mjerenje) je pokazala kako programirana nastava u vidu dodatnog tretmana škole nogometa uz redovitu nastavu tjelesne i zdravstvene kulture, kod sedmogodišnjih dječaka dominantno utječe na razvoj aerobne izdržljivosti, agilnosti, brzine i fleksibilnosti, a kod osmogodišnjih dječaka na razvoj eksplozivne snage, aerobne izdržljivosti, fleksibilnosti i brzine. Trening nogometa već kod osmogodišnjih dječaka dovodi do formiranja motoričkog sklopa koji integrira eksplozivnost, brzinu, koordinaciju, izdržljivost i fleksibilnost kao generalni motorički faktor koji determinira budući razvoj kvalitete u nogometu.