Edu World 2016
7th International Conference

SOMATIC EVOLUTION MOTOR, PERCEŢIE AND REPRESENTATION TO CHILDREN IN ATHLETICS

Bogdan Constantin Raţă (a), Marinela Raţă (b), Gloria Raţă (c)*

* Corresponding author

(a) Vasile Alecsandri University of Bacău, Str. Marasesti, No 157, Bacau, Romania, rbogy75@yahoo.com,
(b) Vasile Alecsandri University of Bacău, Str. Marasesti, No 157, Bacau, Romania, marinela_rata@hotmail.com
(c) Vasile Alecsandri University of Bacău, Str. Marasesti, No 157, Bacau, Romania gloria_rata50@yahoo.com, 0742 233917

Abstract

Developing strength, mobility, coordination and balance in the 10-12-year-old children, practising athletics events is of great importance in the training process. This paper is an experimental observation study, by means of which we aim to highlight the possibility to improve the level of speed, strength, mobility, coordination and balance in the 10-12-year-old children practising specific athletics events. In order to establish the dynamics of child development, we performed the following: an initial test, which had an observation purpose, and a final test, as demonstrative achievement. In order to develop the athletes' behaviour during the experiment (lasting for 14 weeks, 2 hours a day, 4 trainings per week), we practised at the end of each practical lesson, for 10 minutes, the following training: on Mondays - strength exercises, on Tuesdays - speed exercises, on Thursdays - mobility and balance exercises and on Friday - coordination exercises.

The results of the children who took part in the experimental group (12 children) were better in the final evaluation. The progress recorded for the average values emphasizes the efficiency of the applicative intervention oriented towards the increase in the skill level and of the perception capacity and movement representation. The findings revealed the following fact: after 14 weeks of training with the 10-12-year-old children, the level of the somatic development, the level of the development of speed, strength, mobility, coordination and balance and the level of the perception capacity and movement representation improved.

Keywords: coordination; balance; mobility and strength.

I. Introduction

From 10 to 12 years of age, the children's muscular system has an intense development, adapts easily to overwork, improves intra- and inter-muscle coordination, improves muscle elasticity, increases muscle mass and joint mobility. Generally speaking, the process of development and differentiation of the skeletal muscle ends.

Research on the motor performance has a considerable degree of practical penitence by the fact that "measurements can be used to predict the ability of a person in a certain position or a certain activity" (Matthews, Deary, & Whiteman, 2012). The psychomotor skills necessary for practising certain subjects / sports events, "can be detected early, but approaching their education / development is a process that depends on the body's capacity to adapt and to progress" (Raţă, & Raţă, 2006). The motor performance is a "great result of a conscious systematic activity which implies mental efforts, and in some fields, such as sport, also multiple physical efforts, often materialized in records, progress" (Deliu, 2007).

All the life preparation must aim towards "achieving an optimal level of fitness and technique" (Raczek, 1977), since athletic performance is based on the relative harmony of all the psychomotor skills as a whole. Activity, in general, and sports activity, in particular, is made up of technical elements / specific movement actions associated with the "psychic ability of mobilization during their execution times, with the psychic recovery ability and mental resistance to stress, with the perceptions of space and time, with the kinaesthetic sensations necessary for controlling" the body in many situations (Colibaba-Evuleţ, & Bota, 1998).

Skill training has an important role in determining, generically speaking, all the athletes' efficiency in training and competitions. This includes "a whole system of measures ensuring a high functional body capacity by the high level of psycho-motor skill development, optimal values of morpho-functional indices, full possession of the physical exercises used and perfect health" (Dragnea, 1996).

Popescu-Neveanu (1978) believes that performance is "the result of an activity which exceeds the common level, being superior to others". The sports competition is actually a "system of regular or occasional contests held after a sports calendar after an especially-drafted regulation" (Encyclopedia of Physical Education and Sport, Volume IV, 2002).

2. Materials and methods

The purpose of this research is to highlight the dynamics of the level of development of the motor capacity represented by the development of strength, mobility, coordination and balance. The main objectives for carrying out this research topic which resulted from the formulation of the topic and the need for theoretical foundation, were the following: knowledge of the theoretical bases on the development particularities of the children included in the groups of athletes practising athletics; knowledge of the index values which assess the development of skills specific for athletes and their evolution at the age of 10-12. The tasks developed for achieving the objectives of this research were: setting the research topic, the purpose, the objectives, the hypotheses, the methods, the sample included in the research, the testing and the evaluation data, the assessment indicators, the applicative interventions in line with the hypotheses, and also the application of the assessment tests, the collection, the processing and the interpretation of data, the knowledge of progress and the drawing of conclusions. In our work we started from the following hypotheses: during the four months of training, the level of somatic development of the 10-12-year-old children improved; if in the educational process of the 10-12-year-old

children we use strength exercises, mobility, coordination and balance, their level improves; the use of coordination and balance exercises at the age of 10-12 increases the perception capacity and the movement representation. The experiment involved 12 children, 10-12 years of age, from the CSS Bacau. The observation experiment began on 1st September 2015 with the initial assessments and was completed on 30th December 2015 when the final assessments were performed. In conducting the study we used the following research methods: bibliographical study; pedagogical observation experiment; testing, sampling; statistical and mathematical method; graphical method. The statistical indicators that we calculated were as follows: arithmetic mean (X); standard deviation (S); maximum value (V max) and minimum value (V.min). In order to assess the athletes' development we used the following: *measurements* for assessing the somatic development (height, weight and BMI), *tests* to assess the *general motor ability* [5x5m shuttle sprint for assessing the speed ability, *tests* for the upper body lifting (abdomen) for assessing the abdominal muscle strength, *tests* for lifting the torso from a face lying position (back) for assessing the back strength, hip mobility to assess flexibility] and *tests* for assessing coordination (*Matorin* test) and balance (*Flamingo* test). In this research, in order to verify the hypotheses made, we used, throughout the period of research, topics aimed at acquiring the technical elements of athletics and topics aimed at developing strength, mobility, coordination and balance by alternating them. During the four-week training sessions, at the end of each practice, 10 minutes of special training were performed as follows: on Mondays - strength exercises, on Tuesdays - speed exercises, on Thursdays-mobility and balance exercises and on Friday coordination exercises. The means used were changed at the end of each stage of training.

3. Results and discussions

After recording the results of the initial and final assessment tests, these were processed and analyzed. In interpreting the data, we relied on the analysis of the arithmetic mean values, of the standard deviation, of the maximum and minimum values.

The data processing, which assessed the dynamics of the somatic development based on the arithmetic mean, the standard deviation, the maximum and minimum values, highlighted a series of issues.

For *height* (acc. to Table 1. and Fig. 1.), the following data were recorded: an increase by 2 cm in the arithmetic average from 1.47 m in the initial evaluation to 1.49 m in the final evaluation; an increase in the maximum value by 1 cm, from 1.60 m in the initial evaluation to 1.61 m in the final evaluation; an increase in the minimum value by 1 cm from 1.38 m in the initial evaluation to 1.39 m in the final evaluation; maintaining a homogeneity of the group underlined by the same value of the standard deviation of 0.07 in the two tests.

Table 1. Results for the initial and final physical development in the study group

Initials	H			W			BMI		
	I	F	Pg	I	F	Pg	I	F	Pg.
Arithmetic mean	1.47	1.49	0.02	43.67	45.25	1.58	19.89	20.00	-0.10
Standard deviation	0.08	0.08	0.01	10.08	10.06	0.67	2.95	2.83	0.35
V. max.	1.60	1.61	0.01	64.00	65.00	1.00	25.00	25.00	0.30
V. min	1.38	1.39	0.01	31.00	32.00	1.00	16.1	16.12	-0.78

*Legend H= height. W = weight. BMI= body mass index. I= initial. F= final. Pg= progress
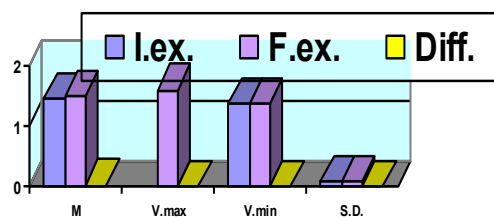

Fig. 1. Height result representation of the study group in the initial and final evaluation
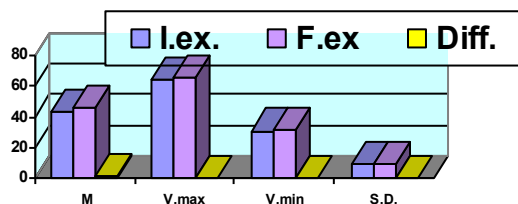

Fig. 2. Weight result representation of the study group in the initial and final evaluation
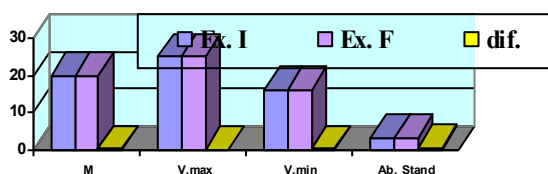

Fig. 3. BMI result representation of the study group in the initial and final evaluation

For *weight* (acc. to Table 1. and Fig. 2.), the following data were recorded: an increase by 1.58 kg in the arithmetic average from 43.67 kg in the initial evaluation to 45.25 kg in the final evaluation; an increase in the maximum value by 1.00 kg, from 64 kg in the initial evaluation to 65 kg in the final evaluation; an increase in the minimum value by 1.00 kg from 31.00 kg in the initial evaluation to 32.00 kg in the final evaluation; a slight change in the homogeneity of the group underlined by a slight decrease of the standard deviation from 10.08 to 10.06 in the two tests.

For *BMI* (acc. to Table 1. and Fig. 3.), the following data were recorded: an increase by 0.11 in the arithmetic average from 19.89 kg m in the initial evaluation to 20.00 kg in the final evaluation; an increase in the maximum value to 25.00, both in the initial and final evaluation; an increase in the minimum value from 16.10 in the initial evaluation to 16.12 in the final evaluation; an improvement in the homogeneity of the group underlined by a standard deviation from 2.95 to 2.83 in the two tests.

The data processing, by means of which we assessed the dynamics of the general motor capacity (Table 2.), based on the arithmetic mean, standard deviation, maximum and minimum values revealed interesting aspects.

Table 2. Results for the initial and final motor development in the study group

Initials	5X5S (S)			Abd. (no)			B (no)		
	I	F	Pg	I	F	Pg	I	F	Pg
Arithmetic mean	5.54	5.28	0.26	19.83	27.83	8.00	19.83	27.58	7.67
Standard deviation	0.27	0.25	0.07	2.41	3.13	1.76	2.95	2.35	1.78
V. max.	6.20	5.90	0.40	23.00	33.00	12.00	24.00	31.00	11.00

V. min	5.40	5.20	0.20	17.00	22.00	5.00	14.00	23.00	5.00

*Legend A5X5SR= sprint (shuttle). Abd. = abdomen. B= back. I= initial. F= final. Pg= progress

For *the 5X5 shuttle sprint, namely 25 m* (acc. to Table 2. and Fig. 4.), the following data were recorded: an improvement by 0.28 from 5.74 s in the initial evaluation to 5.48 s in the final evaluation; an improved maximum value by 0.30 and from 6.20 s in the initial evaluation to 5.90s in the final evaluation; an improvement in the minimum value by 0.20 s from 5.40 s in the initial evaluation to 5.20s in the final evaluation; an improvement of the homogeneity of the group underlined by a slight difference between the value of 0.27 in the initial evaluation and 0.25 in the final evaluation of the standard deviation. From the summary table of results, we can observe that in the 5X5 m sprint in the initial evaluation there were 3 competitors with times over 6 seconds and none in the final evaluation. It can also be observed that six athletes progressed by 0.2 seconds, 5 sportsmen by 0.3 seconds and one sportsman by 0.4 seconds.

For *the upper body lifting* (abdomen) (acc. to Table 2. and Fig. 5.), the following data were recorded: an increase in the arithmetic mean by 8.00 repetitions from 19.83 in the initial evaluation to 27.83 repetitions in the final evaluation, therefore, a substantial improvement; an increase of the maximum value by 10 repetitions from 23 repetitions in the initial evaluation to 33 repetitions in the final evaluation, thus a good growth; an increase in the minimum value by 5 repetitions from 17 repetitions in the initial testing to 22 repetitions in the final testing; a decrease in the homogeneity of the group underlined by two different values of the standard deviation by 2.41 and 3.13 respectively in the two tests. According to the tables of results we can notice that, for the upper body lifting in the initial evaluation, there were 12 athletes with less than 23 repetitions, and only one in the final evaluation. It can also be observed that 10 athletes progressed from 5 to 8 repetitions and two athletes from 10 to 12 repetitions.
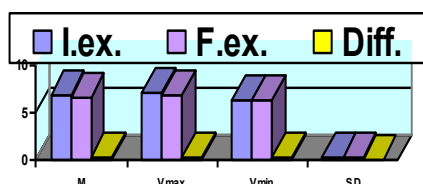

Fig. 4. 25 m sprint (5X5M shuttle) result representation of the study group in the initial and final evaluation
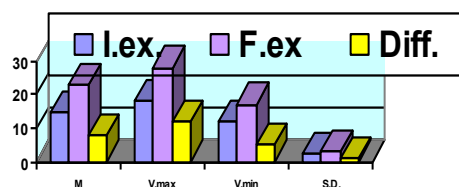

Fig. 5. Upper body lifting result representation of the study group in the initial and final evaluation
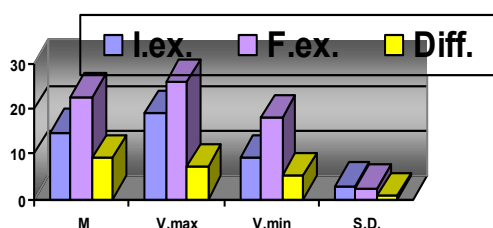
Fig. 6. Result representation for lifting the torso from a face lying position (back)of the study group in the initial and final evaluation

For *lifting the torso from a face lying position (back)* (acc. to Table 2. and Fig. 6.), the following data were recorded: an increase in the arithmetic mean by 7.67 repetitions from 19.83 in the initial evaluation to 27.58 repetitions in the final evaluation, therefore, a substantial improvement; an increase of the maximum value by 7 repetitions from 24 repetitions in the initial evaluation to 31 repetitions in the final evaluation, thus a good growth; an increase in the minimum value by 9 repetitions from 14 repetitions in initial testing to 23 repetitions in the final testing; an improvement in the homogeneity of the group underlined by two different values of the standard deviation of 2.95 and 2.35 respectively in the two tests. According to the tables of unprocessed results we can notice that, for *lifting the torso from a face lying position (back)* in the initial evaluation, there were 12 athletes with less than 23 repetitions, and only one in the final evaluation. It can also be observed that 9 athletes progressed from 5 to 8 repetitions and two athletes from 9 to 11 repetitions. We consider that the individual evolution in the assessment tests for the general motor capacity is good and different from one individual to another. The data processing according to which we assessed the dynamics for developing mobility, coordination and balance (table no. 3) highlighted a number of issues based on the arithmetic mean, the standard deviation, and the maximum and minimum values.

For *the coxofemoral (hip) mobility* (acc. to Table 3. and Fig. 7.), which assessed flexibility, the following data were recorded: an increase in the arithmetic mean by 4.00 cm from 3.75 cm in the initial evaluation to 7.75 cm in the final evaluation, therefore, a substantial improvement; an increase in the maximum value by 4 cm from 8 cm in the initial evaluation to 12 cm in the final evaluation, thus a good growth; an increase in the minimum value by 4 cm from 0 cm in the initial testing to 4 cm in the final testing; a stagnation of homogeneity of the group emphasizes the identity of the two standard deviation values of 2.77 and 2.77 respectively in the two tests. As seen from the results recorded in the coxofemoral (hip) mobility test, there were three athletes in the initial evaluation with values less than 8cm and five athletes in the final evaluation recorded values higher than 9 cm. It can also be observed that one sportsman progressed by 2cm, 4 athletes by 3 cm, 4 athletes by 4 cm, 1 sportsman by 5 cm, 1 sportsman by 6cm, 1 sportsman by 7 cm.

Table 3. Results for the development of mobility, coordination and balance

Initials	CF Mob. (cm)			M T (º)			FT (s)		
	I	F	Pg	I	F	Pg	I	F	Pg
Arithmetic mean	3.75	7.75	4.00	231.00	279.50	48.67	11.83	30.67	19.67
Standard deviation	2.77	2.77	1.41	34.01	30.00	20.59	4.04	10.53	7.81
V. max.	8.00	12.00	7.00	283.00	328.00	71.00	18.00	52.00	34.00
V. min	0.00	4.00	2.00	187.00	235.00	18.00	7.00	18.00	11.00

*Legend: CF Mob. = coxofemoral mobility MT= Matorin Test FT = Flamingo Test, I= initial, F= final, Pg= progress.
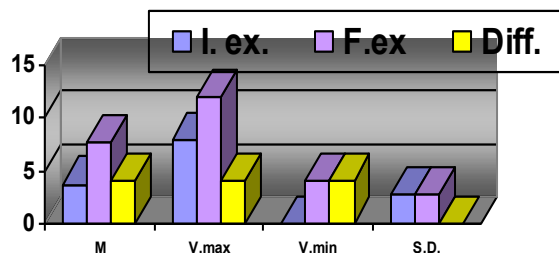
Fig. 7. Result representation for coxofemoral (hip) mobility of the study group in the initial and final evaluation
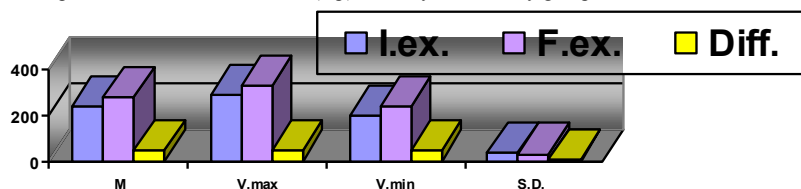

Fig. 8. Result representation for the Matorin Test of the study group in the initial and final evaluation
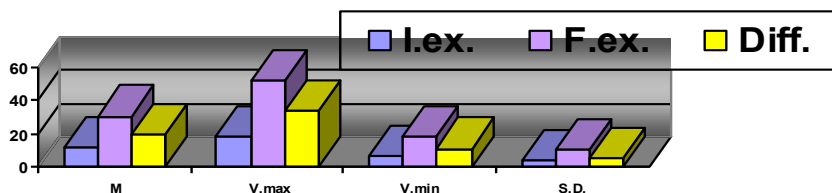

Fig. 9. Result representation for the Flamingo Test of the study group in the initial and final evaluation

For the *Matorin* test (acc. to Table 3. and Fig. 8.) by means of which we assessed coordination, the following data were recorded: an arithmetic mean of 48.64 degrees increased from 231.00 degrees in the initial evaluation to 279.50 degrees in the final evaluation, therefore, a substantial improvement; an increase in the maximum value by 45 degrees from 283 degrees in the initial evaluation to 328 degrees in the final evaluation, consequently a good growth; an increase in the minimum value by 48 degrees from 187 degrees in the initial evaluation to 235 degrees in the final evaluation; a stagnation of homogeneity of the group emphasized the identity of the two standard deviation values of 2.77 and 2.77 respectively in the two tests. As shown in the Table. 3 for the *Matorin* test, in the initial evaluation, there was no sportsman with values below 300º and in the final evaluation, four athletes have values higher than 300º. Furthermore, we can notice that three athletes had a progress between 10 and 49 degrees and 9 athletes between 50 and 71 degrees.

For the *Flamingo* test (acc. to Table 3. and Fig. 9.) by means of which we assessed balance, the following data were recorded: an arithmetic mean of 18.84 seconds increased from 11.83 seconds in the initial evaluation to 30.67 seconds in the final evaluation, therefore, a substantial improvement; an increase in the maximum value by 34 seconds from 18 seconds in the initial evaluation to 52 seconds in the final evaluation, consequently, a good growth; an increase in the minimum value by 11 seconds from 7 seconds in the initial evaluation to 18 seconds in the final evaluation; a decrease of homogeneity of the group emphasized the identity of the two standard deviation values of 4.04 and 4.04 respectively in the two tests. As shown in the unprocessed results for the Flamingo test, the initial assessment there was no sportsman with values below 20 seconds and in the final assessment 11 athletes have values higher than 20 seconds. Furthermore, we can notice that 7 athletes had a progress between 11 and 20 seconds and 5 athletes between 20 and 34 seconds.

4. Conclusion

The data recorded during our research have shown progress and pertinent conclusions.

Regarding the *somatic development*, we recorded average values increased from the initial to the final evaluation materialized in the following progress: 2 cm in height; 1.58 kg in weight; and 0.11 in the body mass index. We consider these increases normal given that the athletes were still growing at this age.

Regarding the *development of the general motor capacity* assessed by the three tests, we observed that the average values increased from the initial to the final evaluation which materialized in the following progress: 0.28 seconds in 5 x 5 m sprint (25 m shuttle); 8.00 repetitions for the *upper body lifting* (abdomen); 7.67 repetitions for *lifting the torso from a face lying position (back)*. We consider these improvements as a very good value taken into account that athletes are at a stage of technique and skill accumulation.

Regarding the *development of mobility, coordination and balance* assessed by the three tests showed average values increased from the initial to the final evaluation which materialized in the following progress: 4.00 cm in the hip mobility test; 48.64 degrees in the *Matorin* coordination test; 18.84 seconds in the Flamingo balance test.

The dynamics of the somatic development, of the sprint motor capacity, of force, mobility, of the perception capacity and movement representation in 10-12-year-old children practising athletic events is rising.

Regarding the hypotheses, we can highlight the following:

- The hypothesis according to which over 14 weeks of training can improve the level of the somatic development was confirmed;

- The hypothesis according to which if the educational process of the 10-12-year-old children uses force, mobility, coordination and balance exercises, their level can improve was confirmed;

- The hypothesis according to which the use of coordination and balance exercises increases the perception capacity and the movement representation was confirmed, an aspect which is supported by the Matorin coordination test and the Flamingo balance test.

References

Colibaba-Evuleţ, D. & Bota, I. (1998). Sports Games – Theory and Methodology (in Romanian: Jocuri Sportive – Teorie şi metodică), *Aladin Publishing House, Bucharest,* 107.

Dragnea, A. (1996). Sports Training (in Romanian - Antrenamentul sportive), *Didactic and Pedagogical Publishing House, Bucharest,* 163.

Deliu, D. (2007). Predicting Sports Performances (in Romanian: Predicţia performanţelor sportive), *Bern Publishing House, Bucharest,* 12.

Matthews, G., Deary, I.J. & Whiteman, M.C. (2012). Personality Psychology – features, causes, consequences (in Romanian: Psihologia personalităţii-trăsături. cauze. consecinţe). *Polirom Publishing House*, Bucharest, 377.

Popescu-Neveanu, P. (1978). Dictionary of Psychology (in Romanian: Dicţionar de psihologie), *Albatros Publishing House, Bucharest,* 41.

Raczek, J. (1977). Sport in Children and Juniors – Training children and juniors as element of sport structure (in Romanian: Sportul la copii şi Juniori - Instruirea copiilor şi juniorilor ca element al structurii sportului), *CNEFS and CCPEFS Publishing House, Bucharest*, 20.

Raţă, G. & Raţă B. (2006). Skills in the motor activity (in Romanian: Aptitudinile în activitatea motrică), *Edusoft Publishing House, Bacău,* 25.

*** Encyclopedia of Physical Education and Sport (in Romanian: Enciclopedia educaţiei fizice şi sportului), (2002). *Volume IV, Aramis Publishing House*, 115.