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Original article

PERFORMANCE PATTERNS FOR OUTDOOR EVENTS IN JUNIOR III FOR GIRLS PENTATHLON-HEXATHLON AND BOYS HEPTATHLON-OCTATHLON

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Abstract*

Aim. Sports training and competition in the combined evidence in athletics are the most complex, time consuming needing a lot of work and attention. The aim of the present study is to reach a model. Training in the combined events is complex, takes time, perseverance and hard work. The evolution of performance in the outdoor competition season shows the athletes' level of training which is determined by the preparation conditions and by the competitors' predispositions. The conducted study shows the dynamics of results achieved by the athletes practising combined evidence at the age of 14-15. The research is a longitudinal study of the results recorded in the period 2003-2015, by the Junior III, in order to achieve performance patterns. The analysis of the performances of the athletes aged 14-15 over a period of 13 years in the combined events helps us achieve the performance patterns.

Conclusions. The longitudinal study has highlighted the possibility to reach performance patterns necessary for predicting training in the combined events of junior athletes in athletics.

Keywords: pentathlon; hexathlon; longitudinal study; performance pattern; juniors

Introduction

Athletics, considered the "king sport" due to the fact that its means are used in the general training in other sports, is "a system of sports exercises of running, jumping and throwing" (DEX, 1998), where the competition is conducted individually and in teams. In athletics, the events are single or combined, and the training ensures "a functional adaptability and a motor one ... which are achieved according to the athletes' individual characteristics" (Larion, 2007). The combined events are extremely complex and enjoyed by teenagers since they "provide multilateral physical athletic training, contribute to the formation and development of the group relationship, team spirit, emulation, solidarity, will to win, and other moral traits and character" (Bobei, 1978). In the combined events, good results cannot be recorded unless athletes are well developed physically, having skills related to speed, strength, stamina, mobility, and coordination while having a good technical execution of each test individually. The success of training in the combined events depends on the "interest that athletes manifest, on their conscious attitude towards the execution of each exercise" (Korobov, 1962, p.18), on the learning capacity of each technical event part, on the ability to adapt to sustained and intense effort, on the ability to resist fatigue. The performance ability is different from person to person and is given by the "complex manifestation of the individual materialized in objective values, or objectified in points, in places, in rankings" (Ababei, 2006, p.121). "In order to achieve a high level, preparation implies a training of all elements according to the event complexity",

involving training "to tolerate fatigue in all forms: central nervous system fatigue, muscle fatigue, lactic acid accumulation" (Bompa, 2003, p.11). In Junior III, for the period 2003-2012 in the competition calendar, at the National Championship (J.III N.C.), the pentathlon was registered as combined event, consisting of: high jump; 200m sprint; long jump with a sprint; weight throw and 800m endurance running and in 2013, the combined sample, in this category, was changed from the pentathlon into hexathlon in the outdoor competition season. Hexathlon consists of the same events to which 100 m hurdles was added. In junior category III, in 2003-2012, in the competition calendar the hexathlon was added as a combined event consisting of: 100m sprint, long jump, weight throw; high jump; discus throw; javelin; 1000m endurance running and in 2013, the combined event, in junior III, was changed from the heptathlon into octathlon. Octathlon consists of the same events as heptathlon plus 110 m hurdles. The total score for determining the final ranking is based on the scores submitted by the International Score Table for each event separately. The final ranking is determined according to the scores recorded in all events included in the combined event.

Research hypothesis

In conducting the research, we started from the hypothesis that "the analysis of the performances of the athletes aged 14-15 over a period of 13 years, in the combined events helps us reach a performance pattern".

Methods

In order to get to verify the hypothesis, we used the following research methods: bibliographic

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study, observation, data processing and analysis, graphical representation. The analyzed results were collected from the archive of the R.A.F. where there are recorded all results achieved by the athletes who practice athletics events at national and international competitions and championships. For establishing the performance patterns we considered the occupants of the 1st, 6th and 12th positions in the combined events in juniors III. The mathematical statistics was made by using Microsoft Office Excel 2003, and as assessment indicators we used the arithmetic mean, maximum value and minimum value.

Results obtained during the outdoor competition season

First place results for junior girls in the outdoor competition season

During 2003-2015, in junior girls (table no.1) the scores obtained by the occupants of the 1st place recorded different values. In 2003, the winner accumulated 4216 points, in 2004 accumulating 3989 points, in 2005 accumulating 3442 points, in 2006 accumulating 4037 points, in 2007 accumulating 3345 points, in 2008 accumulating 3750 points, in 2009 accumulating 3432 points, in 2010 accumulating 4125 points, in 2011 accumulating 3557 points, in 2012 accumulating 4009 points, in 2013 accumulating 3939 points, in 2014 accumulating 3659 points, in 2015 accumulating 3862 points. It can be observed that the best score varied from the lowest in 2007 with 3345 points and the highest in 2003 with 4216 points.

Table no. 1 Results for the 1st place at the National Championship for Juniors III, 2003-2015, outdoor pentathlon and hexathlon in junior girls

Crt. no.	Initials	Year	100 m h(s)	H(m)	200(s)	L(m)	W(m)	800m(min)	Points
1.	N.S.	2003	--	1.62	27.27	5.13	12.79	2,35	4216
2.	D.D.	2004	--	1.64	28.00	4.86	11.74	2,36	3989
3.	D.E.	2005	--	1.52	28.80	5.14	9.78	2,54	3442
4.	G.M.	2006	--	1.57	26.34	5.12	8.39	2,28	4037
5.	V.A.	2007	--	1.51	28.54	4.71	7.82	2,38	3345
6.	R.B.	2008	--	1.38	25.12	5.15	5.68	2,16	3750
7.	P.E.	2009	--	1.43	27.43	4.73	8.29	2,31	3432
8.	P.E.	2010	--	1.50	27.18	5.40	10.39	2,22	4125
9	A.L.	2011	--	1.39	27.06	4.87	7.57	2,27	3557
10	A.L.	2012	--	1.50	25.14	4.95	8.44	2,25	4009
Arithmetic mean				1.51	27.09	5.01	9.09	2.31	3790.20
Maximum value				1.64	25.12	5.40	12.79	2.16	4216
Minimum value				1.38	28.80	4.71	5.68	2.54	3345
11	A.G.	2013	15.95	1.58	27.54	5.30	10.58	2,35	3939
12	A.A.	2014	16.61	1.69	27.10	4.76	7.35	2,28	3659
13	Z.I.	2015	16.03	1.55	27.86	5.17	9.67	2,35	3862
Arithmetic mean			16.20	1.61	27.50	5.08	9.20	2.33	3820.00
Maximum value			15.95	1.69	27.10	5.30	10.58	2.28	3939
Minimum value			16.61	1.55	27.86	4.76	7.35	2.35	3659

*Legend: 100mh= 100m hurdles, H= high jump; 200m= 200m sprint; L= long jump; W=weight throw; 800m= 800m endurance running.

The statistical data highlighted the following:
 - in the pentathlon, the arithmetic mean of the general score was 3790 points, with a maximum of 4216 points and a minimum of 3345 points. Regarding each component event, we found the following: in the high jump, the arithmetic mean is 1.51 m, the maximum value is 1.64 m and the minimum value of 1.38 m, in the 200 m sprint, the arithmetic mean is 27.09, the maximum value is 25.12 s and the minimum value of 28.80, in the long jump, the arithmetic mean was 5.01 m, the maximum value is 5.40 m and the minimum value of 4.71 m, in weight throw with a sprint, the arithmetic mean is 9.09 m, 12.79 m is the maximum value and the minimum value is 5.68 m, in the 800m endurance running on a flat surface, the arithmetic

mean is 2.31 minutes, the maximum value is 2.16 minutes and 2.54 minutes is the minimum value;

- in the hexathlon, the arithmetic mean of the general score recorded a value of 3820 points, with a maximum of 3939 points and a minimum of 3659 points. It can also be observed that in each event the performances were different as follows: in the 100m hurdles the arithmetic mean was 16.20 and the extreme values were 15.95s and 16.61s, in the high jump, the arithmetic mean is 1.61 m, and the extreme values of 1.69 m and 1.55 m, in the 200m sprint, the arithmetic value is 27.60 s m and the extreme values of 27.10 s and 27.86 s, in the long jump, the arithmetic mean is 5.08 m and the extreme values of 5.30 m and of 4.76m, in the weight throw with a sprint the arithmetic mean is 9.20 m and the extreme values of 10.58 m and 7.35 m, in the 800 m



endurance running on a flat surface, the arithmetic mean is 2.33 minutes and the extreme values of 2.28 minutes and 2.35 minutes.

First place results for junior boys in the outdoor competition season

During 2003-2015, in junior boys (table no.2) the scores obtained by the occupants of the 1st place recorded different values. In 2003, the winner accumulated 4652 points, in 2004 accumulating 4090 points, in 2005 accumulating 3734 points, in 2006 accumulating 4159 points, in 2007 accumulating 4074 points, in 2008 accumulating 4112 points, in 2009 accumulating 4582 points, in 2010 accumulating 4368 points, in 2011 accumulating 4530 points, in 2012 accumulating 4657 points, in 2013 accumulating 4506 points, in 2014 accumulating 4081 points, in 2015 accumulating 4512 points. It can be observed that the best score varied from the in the highest 2012 with 4657 points and the lowest in 2005 with 3734 points.

The statistical data highlighted the following:

- in the heptathlon, the arithmetic mean of the general score was 4295.8 points, with a maximum of 4657 points and a minimum of 3734 points. Regarding each component event we found the following: in in the 100m sprint, the arithmetic mean is 12.36 s, the maximum value is 11.93 s and the minimum value is 12.88 s, in the long jump, the arithmetic mean is 5.60 m, the maximum value is 6.02 m and the minimum value of 5.24 m, in the weight throw, the arithmetic mean is 11.07 m, the maximum value is 13.37 m is and the minimum value is 9.06 m, in the high jump, the arithmetic

mean is 1.65 m, the maximum value is 1.91 m and the minimum value of 1.49 m, in the discus throw, the arithmetic mean is 32.68 m, the maximum is 50.02 m and the minimum value of 23.71 m, in the javelin, the arithmetic mean is 38.11m, the maximum is 47.07 m and 26.40 m is the minimum value, in the 1000m endurance running on a flat surface, the arithmetic mean is 3.07 minutes, 2.50 minutes is the maximum value and the minimum value is 3.24 minutes;

- in the octathlon, the arithmetic mean of the general score recorded a value of 4366.32 points, with a maximum of 4512 points and a minimum of 4081 points. It can also be observed that in each event the performances were different as follows: in the 100 m sprint, the arithmetic mean is 12.29 and the maximum is 11.73 s and the minimum is 12.65 s, in the long jump, the arithmetic mean is 5.95 m, the maximum value is 6.27 m and the minimum value is 5.78 m, in the weight throw, the arithmetic mean is 11.46, the maximum is 15.11 m and the minimum value of 8.61 m, in the high jump, the arithmetic mean is 1.61 m, the maximum value is 1.72 m and the minimum value of 1.54 m, in the 110m hurdles, the arithmetic mean is 17.08 and the maximum is 16.03 s and 18.93s is the minimum value, in the discus throw, the arithmetic mean is 31.82 m, the maximum is 50.55 m and 20.10 m is the minimum value, in the javelin, the arithmetic mean is 37.68m, the maximum is 51.83 m and 26.30 m is the minimum value, in the 1000 m endurance running on a flat surface is 3.19 minutes, 2.55 minutes is the maximum and the minimum value is 3.48 minutes.

Table no. 2 Results for the 1st place at the National Championship for Juniors III, 2003-2015, outdoor heptathlon and octathlon in junior boys

Crt. no.	Initials	Year	100m (s)	L (m)	W m	H (m)	110mh (s)	D (m)	J (m)	1000m (min)	Points
1.	S.P.	2003	12.65	5.24	12.67	1.66		50.02	40.82	3.11	4652
2.	S.R.	2004	12.49	5.37	9.62	1.58		30.94	44.11	3.13	4090
3.	R.B.	2005	12.52	5.25	9.06	1.49		28.85	33.12	3.14	3734
4.	B.A.	2006	12.48	5.78	9.85	1.74		25.11	26.40	3.01	4159
5.	Ş.R.	2007	12.24	5.69	10.75	1.56		30.24	32.85	3.16	4074
6.	M.Ş.	2008	12.88	5.69	11.14	1.62		31.13	47.07	3.23	4112
7.	B.M.	2009	11.93	5.70	12.13	1.57		37.03	40.65	3.13	4582
8.	S.D.	2010	12.11	6.02	10.59	1.70		23.71	39.22	3.03	4368
9.	P.D.	2011	12.18	5.42	11.52	1.66		33.27	36.01	2.50	4530
10.	M.I.	2012	12.08	5.80	13.37	1.91		36.47	40.89	3.24	4657
Arithmetic mean			12.36	5.60	11.07	1.65		32.68	38.11	3.07	4295.80
Maximum value			11.93	6.02	13.37	1.91		50.02	47.07	2.50	4657
Minimum value			12.88	5.24	9.06	1.49		23.71	26.40	3.24	3734
11.	S.V.	2013	11.73	6.27	8.61	1.72	16.28	20.10	34.90	2.55	4506
12.	P.A.	2014	12.65	5.78	10.65	1.54	16.03	24.81	26.30	3.48	4081
13.	Z.C.	2015	12.49	5.79	15.11	1.57	18.93	50.55	51.83	2.55	4512
Arithmetic mean			12.29	5.95	11.46	1.61	17.08	31.82	37.68	3.19	4366.33
Maximum value			11.73	6.27	15.11	1.72	16.03	50.55	51.83	2.55	4512
Minimum value			12.65	5.78	8.61	1.54	18.93	20.10	26.30	3.48	4081

*Legend: 100m= 100m sprint; L= long jump; W=weight throw; H= high jump; 100mh= 100m hurdles, D=discus throw; J=javelin; 1000m= 1000m endurance running.



Sixth place results for junior girls in the outdoor competition season

During 2003-2015, in junior girls (table no.3) the scores obtained by the occupants of the 6th place recorded different values. In 2003, the winner accumulated 3256 points, in 2004 accumulating 3191 points, in 2005 accumulating 1840 points, in 2006 accumulating 2862 points, in 2007 accumulating 1882 points, in 2008 accumulating 3379 points, in 2009 accumulating 2789 points, in 2010 accumulating 3320 points, in 2011 accumulating 2956 points, in 2012 accumulating 3312 points, in 2013 accumulating 2227 points, in 2014 accumulating 2961 points, in 2015 accumulating 2779 points. It can be observed that the best score varied from the in the lowest in 2005 with 1840 points and the highest in 2008 with 3379 points.

The statistical data highlighted the following:

- in the pentathlon, the arithmetic mean of the general score was 2878.70 points, with a maximum of 3379 points and a minimum of 1840 points. Regarding each component event we found the following: in the high jump, the arithmetic mean is 1.39 m, the maximum value is 1.56 m and the minimum value of 1.18 m, in the 200 m sprint, the arithmetic mean is 29.58 s, the maximum value is 27.76 s and the minimum value of 31.92 s, in the

long jump, the arithmetic mean was 4.64 m, the maximum value is 5.26 m and the minimum value of 4.10 m, in the weight throw with a sprint, the arithmetic mean is 7.68 m, 10.32 m is the maximum value and the minimum value is 5.59 m, in the 800m endurance running on a flat surface, the arithmetic mean is 2.57 minutes, the maximum value is 2.34 minutes and 3.07 minutes is the minimum value;

- in the hexathlon, the arithmetic mean of the general score recorded a value of 2822,33 points, with a maximum of 2961 points and a minimum of 2727 points. It can also be observed that in each event the performances were different as follows: in the 100m hurdles the arithmetic mean was 19.35s and the extreme values were 18.21 s and 21.57 s, in the high jump, the arithmetic mean is 1.33 m, and the extreme values of 1.46 m and 1.22 m, in the 200m sprint, the arithmetic value is 28.70 s m and the extreme values of 27.45 s and 30.22 s, in the long jump, the arithmetic mean is 4.72 m and the extreme values of 5.05 m and of 4.16 m, in the weight throw with a sprint the arithmetic mean is 8.23 m and the extreme values of 8.89 m and 7.78 m, in the 800 m endurance running on a flat surface, the arithmetic mean is 2.44 minutes and the extreme values of 2.37 minutes and 2.50 minutes.

Table no. 3 Results for the 6th place at the National Championship for Juniors III, 2003-2015, outdoor pentathlon and hexathlon in junior girls

Crt. no.	Initials	Year	100 mh(s)	H(m)	200(s)	L(m)	W(m)	800m(min)	Points
1.	C.A.	2003	--	1.23	27.76	4.59	7.57	2.45	3256
2.	T.E.	2004	--	1.46	30.37	4.66	7.96	2.34	3191
3.	D.T.	2005	--	1.46	31.92	--	6.04	3.07	1840
4.	V.F.	2006	--	1.39	29.92	4.48	7.10	2.36	2862
5.	S.D.	2007	--	1.18	31.50	4.10	5.62	2.58	1882
6.	V.A.	2008	--	1.50	28.52	4.83	7.82	2.40	3379
7.	B.F.	2009	--	1.43	29.25	4.42	8.57	2.58	2789
8.	B.F.	2010	--	1.47	29.03	5.26	10.23	2.53	3320
9.	C.R.	2011	--	1.24	27.98	4.69	5.59	2.35	2956
10.	T.A.	2012	--	1.56	29.59	4.69	10.32	3.01	3312
Arithmetic mean				1.39	29.58	4.64	7.68	2.57	2878.70
Maximum value				1.56	27.76	5.26	10.32	2.34	3379
Minimum value				1.18	31.92	4.10	5.59	3.07	1840
11.	M.D.	2013	21.57	1.22	27.45	4.95	7.78	2.37	2727
12.	C.G.	2014	18.37	1.30	28.43	5.05	8.40	2.45	2961
13.	I.C.	2015	18.11	1.46	30.22	4.16	8.89	2.50	2779
Arithmetic mean			19.35	1.33	28.70	4.72	8.36	2.44	2822.33
Maximum value			18.11	1.46	27.45	5.05	8.89	2.50	2961
Minimum value			21.57	1.22	30.22	4.16	7.78	2.37	2727

*Legend: 100mh= 100m hurdles, H= high jump; 200m= 200m sprint; L= long jump; W=weight throw; 800m= 800m endurance running.

Sixth place results for junior boys in the outdoor competition season

During 2003-2015, in junior boys (table no.4) the scores obtained by the occupants of the 6th place recorded different values. In 2003, the winner accumulated 3455 points, in 2004 accumulating

3406 points, in 2005 accumulating 3468 points, in 2006 accumulating 3870 points, in 2007 accumulating 3757 points, in 2008 accumulating 3618 points, in 2009 accumulating 3627 points, in 2010 accumulating 3321 points, in 2011 accumulating 3583 points, in 2012 accumulating



2950 points, in 2013 accumulating 2874 points, in 2014 accumulating 3228 points, in 2015 accumulating 3739 points. It can be observed that the best score varied from the in the highest in 2006 with 3870 points and the lowest in 2013 with 2874 points.

The statistical data highlighted the following:

- in the heptathlon, the arithmetic mean of the general score was 3584,40 points, with a maximum of 3870 points and a minimum of 3321 points. Regarding each component event we found the following: in in the 100m sprint, the arithmetic mean is 12.78 s, the maximum value is 12.32 s and the minimum value is 13.47 s, in the long jump, the arithmetic mean is 5.19 m, the maximum value is

5.69 m and the minimum value of 4.39 m, in the weight throw, the arithmetic mean is 9.87 m, the maximum value is 11.74 m is and the minimum value is 7.61 m, in the high jump, the arithmetic mean is 1.51 m, the maximum value is 1.70 m and the minimum value of 1.35 m, in the discus throw, the arithmetic mean is 27.36 m, the maximum is 31.65 m and the minimum value of 24.10 m, in the javelin, the arithmetic mean is 30.05 m, the maximum is 45.11 m and 22.02 m is the minimum value, in the 1000m endurance running on a flat surface, the arithmetic mean is 3.09 minutes, 2.56 minutes is the maximum value and the minimum value is 321 minutes;

Table no. 4 Results for the 6th place at the National Championship for Juniors III, 2003-2015, outdoor heptathlon and octathlon in junior boys

Crt. no.	Initials	Year	100m (s)	L (m)	W m	H (m)	110mh (s)	D (m)	J (m)	1000m (min)	Points
1.	M.A	2003	12.95	4.67	9.03	1.48		30.98	30.60	3.15	3455
2.	P.D.	2004	13.40	5.08	9.00	1.46		25.52	34.00	3.19	3406
3.	T.M.	2005	12.74	5.34	7.61	1.46		26.22	23.15	3.03	3468
4.	D.T.	2006	12.92	4.39	11.74	1.59		28.55	45.11	3.13	3870
5.	S.T.	2007	12.32	5.22	10.30	1.53		24.19	31.88	3.10	3757
6.	B.Z.	2008	12.48	5.52	8.95	1.35		25.51	22.02	2.56	3618
7.	S.V.	2009	12.56	5.69	11.37	1.60		27.03	35.07	3.24	3627
8.	C.G.	2010	13.47	5.22	10.22	1.49		31.65	28.62	3.14	3321
9.	T.T.	2011	12.60	5.37	10.84	1.48		26.80	25.78	3.21	3583
10.	C.B.	2012	12.33	5.44	9.66	1.70		27.15	24.29	3.17	3739
Arithmetic mean			12.78	5.19	9.87	1.51		27.36	30.05	3.09	3584.40
Maximum value			12.32	5.69	11.74	1.70		31.65	45.11	2.56	3870
Minimum value			13.47	4.39	7.61	1.35		24.19	22.02	3.24	3321
11.	D.V.	2013	13.25	4.84	8.61	1.45	20.26	23.54	22.44	3.21	2874
12.	D.C.	2014	12.71	5.51	9.23	1.54	19.34	23.72	26.98	3.34	3228
13.	D.A.	2015	12.64	5.48	9.59	1.57	19.45	--	27.24	3.32	2950
Arithmetic mean			12.87	5.28	9.14	1.52	19.68	23.63	25.55	3.29	3017.33
Maximum value			12.64	5.51	9.59	1.57	19.34	23.72	27.24	3.21	3228
Minimum value			13.25	4.84	8.61	1.45	20.26	23.54	22.44	3.34	2874

*Legend: 100m= 100m sprint; L= long jump; W=weight throw; H= high jump; 100mh= 100m hurdles, D=discus throw; J=javelin; 1000m= 1000m endurance running.

- in the octathlon, the arithmetic mean of the general score recorded a value of 3017.33 points, with a maximum of 3228 points and a minimum of 2874 points. It can also be observed that in each event the performances were different as follows: in the 100 m sprint, the arithmetic mean is 12.87 s and the maximum is 12.64 s and the minimum is 13.25 s, in the long jump, the arithmetic mean is 5.28 m, the maximum value is 5.51 m and the minimum value is 4.84 m, in the weight throw, the arithmetic mean is 9.14 m, the maximum is 9.59 m and the minimum value of 8.61 m, in the high jump, the arithmetic mean is 1.52 m, the maximum value is 1.57 m and the minimum value of 1.45 m, in the 110m hurdles, the arithmetic mean is 19.68 s and the maximum is 19.34 s and 20.28 s is the minimum value, in the discus throw, the arithmetic mean is 23.63 m, the maximum is 23.72 m and 23.54 m is the minimum

value, in the javelin, the arithmetic mean is 25.55 m, the maximum is 27.24 m and 22.44 m is the minimum value, in the 1000 m endurance running on a flat surface is 3.29 minutes, 3.21 minutes is the maximum and the minimum value is 3.34 minutes.

Twelfth place results for junior girls in the outdoor competition season

During 2003-2015, in junior girls (table no.5) the scores obtained by the occupants of the 12th place recorded different values. In 2003 2005, 2007, 2009 and 2015, less than 10 junior girls participated, the occupant of the 12th place accumulated 3083 points in 2004, accumulating 2498 points in 2006 accumulating 2548 points in 2008, accumulating 2434 points in 2010, accumulating 2229 points in 2011, accumulating 2168 points in 2012, accumulating 2370 points in 2013, accumulating



2729 points in 2014. It can be observed that the best score varied from the in the lowest in 2012 with

2168 points and the highest in 2004 with 3083 points.

Table no. 5 Results for the 12th place at the National Championship for Juniors III, 2003-2015, outdoor pentathlon and hexathlon in junior girls

Crt. no.	Initials	Year	100 mh(s)	H(m)	200(s)	L(m)	W(m)	800m(min)	Points
1.	--	2003							
2.	N.A.	2004	--	1.31	28.97	4.36	8.21	2.42	3083
3.	--	2005							
4.	D.A.	2006	--	1.27	29.12	4.37	10.07	2.42	2498
5.	--	2007							
6.	I.L.	2008	--	1.47	28.82	4.76	7.00	--	2548
7.	--	2009							
8.	B.R.	2010	--	1.32	29.19	4.60	7.86	3.03	2434
9	I.M.	2011	--	1.21	31.72	4.07	10.94	3.07	2229
10	A.M.	2012	--	1.26	31.28	3.97	5.82	2.54	2168
Arithmetic mean				1,31	29,85	4,36	8,32	2,54	2493,33
Maximum value				1,47	28,82	4,76	10,94	2,42	3083
Minimum value				1,21	31,72	3,97	5,82	3,07	2168
11	S.A.	2013	20.57	1.46	29.78	4.62	7.48	3.18	2370
12	C.M.	2014	19.08	1.33	29.03	4.54	9.46	2.53	2729
13	--	2015							
Arithmetic mean			19.83	1.40	29.41	4.58	8.47	3.06	2549.5
Maximum value			19.08	1.46	29.03	4.62	9.46	2.53	2729
Minimum value			20.57	1.33	29.78	4.54	7.48	3.18	2370

*Legend: 100mh=100m hurdles, H=high jump; 200m=200m sprint; L=long jump; W=weight throw; 800m= 800m endurance running.

The statistical data highlighted the following:

- in the pentathlon, the arithmetic mean of the general score was 2493.33 points, with a maximum of 3083 points and a minimum of 2168 points. Regarding each component event we found the following: in the high jump, the arithmetic mean is 1.31 m, the maximum value is 1.47 m and the minimum value of 1.21 m, in the 200 m sprint, the arithmetic mean is 29.85 s, the maximum value is 28.82 s and the minimum value of 31.72 s, in the long jump, the arithmetic mean was 4.36 m, the maximum value is 4.76 m and the minimum value of 3.97 m, in weight throw with a sprint, the arithmetic mean is 8.32 m, 10.94 m is the maximum value and the minimum value is 5.82 m, in the 800m endurance running on a flat surface, the arithmetic mean is 2.54 minutes, the maximum value is 2.42 minutes and 3.07 minutes is the minimum value;

- in the hexathlon, the arithmetic mean of the general score recorded a value of 2549,50 points, with a maximum of 2729 points and a minimum of 2370 points. It can also be observed that in each event the performances were different as follows: in the 100m hurdles the arithmetic mean was 19.83 s and the extreme values were 19.08 s and 20.57 s, in the high jump, the arithmetic mean is 1.40 m, and the extreme values of 1.46 m and 1.33 m, in the 200m sprint, the arithmetic value is 29.41 s m and

the extreme values of 29.03 s and 29.70 s, in the long jump, the arithmetic mean is 4.58 m and the extreme values of 4.62 m and of 4.54 m, in the weight throw with a sprint the arithmetic mean is 8.47 m and the extreme values of 9.46 m and 7.48 m, in the 800 m endurance running on a flat surface, the arithmetic mean is 3.06 minutes and the extreme values of 2.53 minutes and 3.18 minutes.

Twelfth place results for junior boys in the outdoor competition season

During 2003-2015, in junior boys (table no.4) the scores obtained by the occupants of the 12th place recorded different values. In 2003, 2009, 2013 and 2015 the, there were only 9 competitors. In 2003, the junior boy on the 12th place accumulated 1741 points (no points in the long jump, where all three attempts were exceeded), in 2004 accumulating 2442 points, 2006 accumulating 1678 points (no scores at javelin and 1000m running), in 2007 accumulating 2775 points, in 2008 accumulating 2947 points, in 2010 accumulating 3219 points, in 2011 accumulating 2124 points, in 2012 accumulating 2879 points, in 2014 accumulating 2943 points. It can be observed that the best score varied from the in the highest in 2010 with 3219 points and the lowest in 2006 with 1678 points.



Table no. 6 Results for the 12th place at the National Championship for Juniors III, 2003-2015, outdoor heptathlon and octathlon in junior boys

Crt. no.	Initials	Year	100m (s)	L (m)	W m	H (m)	110mh (s)	D (m)	J (m)	1000m (min)	Points
1.	P.B.	2003	14.49	--	5.77	1.45		24.00	21.25	3,32	1741
2.	E.I.	2004	13.68	4.39	6.34	1.43		19.47	21.10	3,29	2442
3.	--	2005	--	--	--	--		--	--	--	--
4.	T.M.	2006	14.64	3.91	10.75	1.23		26.83	--	--	1678
5.	C.S.	2007	13.25	4.34	8.46	1.44		22.65	23.47	3,13	2775
6.	P.V.	2008	13.36	5.24	8.54	1.38		20.81	29.31	3,30	2947
7.	--	2009	--	--	--	--		--	--	--	--
8.	D.V.	2010	12.83	4.57	10.78	1.46		--	32.22	3,23	3219
9.	T.V.	2011	14.95	4.04	9.37	1.36		26.30	24.91	3,58	2124
10.	A.I.	2012	13.56	4.51	12.50	1.52		31.57	23.14	3,45	2879
Arithmetic mean			13.85	4.43	9.06	1.41		24.52	25.06	3.33	2475.63
Maximum value			12.83	5,24	12.5	1.52		31.57	32.22	3.13	3219
Minimum value			14.95	3,91	5.77	1.23		19.47	21.10	3.58	1678
11.	--	2013	--	--	--	--		--	--	--	--
12.	S.C.	2014	12.34	4.60	8.61	1.51	21.15	21.82	21.04	3,17	2943
13.	--	2015	--	--	--	--	--	--	--	--	--
Arithmetic mean			12.34	4.60	8.61	1.51	21.15	21.82	21.04	3.17	2943.00

*Legend: 100m= 100m sprint; L= long jump; W=weight throw; H= high jump; 100mh= 100m hurdles, D=discus throw; J=javelin; 1000m= 1000m endurance running.

The statistical data highlighted the following:

- in the heptathlon, the arithmetic mean of the general score was 2475.63 points, with a maximum of 3219 points and a minimum of 1678 points. Regarding each component event we found the following: in in the 100m sprint, the arithmetic mean is 13.85 s, the maximum value is 12.83 s and the minimum value is 14.95 s, in the long jump, the arithmetic mean is 4.43 m, the maximum value is 5.24 m and the minimum value of 3.91 m, in the weight throw, the arithmetic mean is 9.06 m, the maximum value is 12.50 m is and the minimum value is 5.77 m, in the high jump, the arithmetic mean is 1.41 m, the maximum value is 1.52 m and the minimum value of 1.23 m, in the discus throw, the arithmetic mean is 24.52 m, the maximum is 31.57 m and the minimum value of 21.10 m, in the javelin, the arithmetic mean is 25.06 m, the maximum is 32.22 m and 21.10 m is the minimum value, in the 1000m endurance running on a flat surface, the arithmetic mean is 3.33 minutes, 3.13 minutes is the maximum value and the minimum value is 3.58 minutes;

- in the octathlon, only in 2014 there were over 12 competitors and the occupant of this place recorded the following results: 12.34 seconds in the 100 m sprint, 4.60 m in the long jump, 8.61 m in the weight throw, 1.51 m in the high jump, 21.15 s in the 110m hurdles, 21.82 m in the discus throw, 21.04 at javelin and 3.17 min in the 1000 m endurance running.

Discussions

The data analysis allowed us to reach two performance patterns for the combined event in Junior III. One pattern for the pentathlon and one for the hexathlon, each with three levels: an initial, an intermediate and a final (table no. 7).

In the pentathlon (tab. No. 7) the performance pattern manifests:

- at the level of the 1st place: between 1.39 to 1.56 m in the high jump, from 27.09 to 25.12 in the 200m sprint, between 5.01 to 5.40 m in the high jump, between 9.09 to 12.79 m in weight throw, between 2.31 to 2.16 minutes in the 800 m endurance running and a total score between 3790-4212 points;

- at the level of the 6th place: between 1.39 to 1.56 m in the high jump, from 29.58 s to 27.76 s in the 200m sprint, between 4.64 m to 5.26 m in the high jump, between 7.68 m to 10.32 m in weight throw, between 2.57 to 2.34 minutes in the 800 m endurance running and a total score between 2878.70-3379 points;

- at the level of 12th place: between 1.31 to 1.47 m in the high jump, from 29.85 s to 31.72 s in the 200m sprint, between 4.36 m to 4.76 m in the high jump, between 8.32 m to 10.94 m in weight throw, between 2.54 to 3.07 minutes in the 800 m endurance running and a total score between 2493.33-3083 points;



Table no. 7. Performance pattern at three levels in the junior girls' outdoor pentathlon and hexathlon

	Ranking	100mg (s)	H(m)	200m(s)	L(m)	W(m)	800m (min)	Total (puncte)
Pentathlon	I		1.51-1.64	27.09-25.12	5.01-5.40	9.09-12.79	2.31-2.16	3790-4216
	VI		1.39-1.56	29.58-27.76	4.64-5.26	7.68-10.32	2.57-2.34	2878.70-3379
	XII		1.31-1.47	29.85-31.72	4.36-4.76	8.32-10.94	2.54-3.07	2493.33-3083
Hexathlon	I	16.20-15.95	1.61-1.69	27.50-27.10	5.08-5.30	9.20-10.58	2.33-2.28	3820.00-3939
	VI	19.35-18.11	1.33-1.46	28.70-27.45	4.72-5.05	8.36-8.89	2.44-2.50	2822.33-2961
	XII	19.83-19.08	1.40-1.46	29.41-29.03	4.58-4.62	8.47-9.46	3.06-2.53	2549.50-2729

In the hexathlon (tab. no. 7) the performance pattern manifests:

- at the level of the 1st place: between 16.20 s to 15.95 s in 100m hurdles, between 1.61m to 1.69m in the high jump, between 27.50-27.10s in 200m sprint, between 5.08m to 5.30m in the long jump, between 9.20 to 10.58m in the weight throw, between 2.33 to 2.28 minutes in the 800 m endurance running and a total score of between 3820.00 to 3939 points;

- at the level of the 6th place: between 19.35s to 18.11 s in 100m hurdles, between 1.33m to 1.46m in the high jump, between 28.70s to 27.45s in 200m sprint, between 4.72m to 5.05m in the long jump, between 8.36m to 8.89 m in the weight throw, between 2.44 to 2.50 minutes in the 800 m endurance running and a total score of between 2822.33 to 2961 points;

- at the level of the 12th place: between 19.83s to 19.08 s in 100m hurdles, between 1.40m to 1.46m in the high jump, between 29.41s to 29.03s in 200m sprint, between 4.58m to 4.62m in the long jump, between 8.47m to 9.46m in the weight throw, between 3.06 to 2.53 minutes in the 800 m endurance running and a total score of between 2549.50 to 2729 points;

The data analysis allowed us to represent two performance patterns for the combined event in Junior III. One pattern for the heptathlon and one for the octathlon, each with three levels: an initial, an intermediate and a final (table no. 8).

In the heptathlon (tab. no. 8) the performance patterns has the following values:

- at the level of the 1st place: between 12.36s to 11.93s in the 100m sprint, between 5.60 to 6.02 m in the long jump, between 11.07 to 13.37 m in the weight throw, between 1.65 to 1.91 m in the high jump, between 32.68m to 50.02 m in the discus throw, between 38.11m to 47.07 m at javelin, between 3.07 to 2.50 minutes in the 1000 m endurance running and a total score ranging from 4295.80 to 4657 points;

- at the level of the 6th place: between 12.78s to 12.32 s in the 100m sprint, between 5.19 to 5.69m in

the long jump, between 9.87 to 11.74m in the weight throw, between 1.51 to 1.70 m in the high jump, between 27.36 m to 31.65m in the discus throw, between 30.05 m to 45.11 m at javelin, between 3.09 to 2.56 minutes in the 1000 m endurance running and a total score ranging from 3584.40 to 3870 points;

- at the level of the 12th place: between 13.85s to 12.83s in the 100m sprint, between 4.43 to 5.24 m in the long jump, between 9.06 to 12.5 m in the weight throw, between 1.41m to 1.52 m in the high jump, between 24.52m to 31.57m in the discus throw, between 25.06 m to 32.22m at javelin, between 3.33 to 3.13 minutes in the 1000 m endurance running and a total score ranging from 2475.63 to 3219 points;

In the octathlon (tab. no. 8) the performance patterns has the following values:

- at the level of the 1st place: between 12.29 to 11.73 in the 100m sprint, between 5.95 to 6.27 m in the long jump, between 11.46 to 15.11m in the weight throw, between 1.61 to 1.72m in the high jump, between 17.08 to 16.03 s in the 110 m hurdles, between 31.82 to 50.55m in the discus throw, between 37.68 to 51.83m at javelin, between 3.19 to 2.55 minutes in the 1000m endurance running and a total score ranging from 4366.33 to 4512 points;

- at the level of the 6th place: between 12.87 to 12.64 in the 100m sprint, between 5.28 to 5.51 m in the long jump, between 9.14 to 9.59 m in the weight throw, between 1.52 to 1.57 m in the high jump, between 19.68 to 19.34 s in the 110 m hurdles, between 23.63 to 23.72 m in the discus throw, between 25.55 to 27.24 m at javelin, between 3.29 to 3.21 minutes in the 1000m endurance running and a total score ranging from 3017.33 to 3228 points;

- at the level of the 12th place: $\leq 12.34s$ in the 100m sprint, ≥ 4.60 m in the long jump, $\geq 8.61m$ in the weight throw, ≥ 1.51 m in the high jump, ≤ 21.15 s in the 110 m hurdles, ≥ 21.82 m in the discus throw, ≥ 21.04 m at javelin, ≤ 3.17 minutes in the 1000m endurance running and a total score of ≥ 2943 points;

Table no. 8. Performance pattern at three levels in the junior boys' outdoor heptathlon and octathlon

Ranking		100m(s)	L (m)	W. m	H (m)	110mh (s)	D (m)	J (m)	1000m (min)	Points
Heptathlon	I	12.36-11.93	5.60-6.02	11.07-13.37	1.65-1.91		32.68-50.02	38.11-47.07	3.07-2.50	4295.80-4657
	VI	12.78-12.32	5.19-5.69	9.87-11.74	1.51-1.70		27.36-31.65	30.05-45.11	3.09-2.56	3584.40-3870
	XII	13.85-12.83	4.43-5.24	9.06-12.5	1.41-1.52		24.52-31.57	25.06-32.22	3.33-3.13	2475.63-3219
Octathlon	I	12.29-11.73	5.95-6.27	11.46-15.11	1.61-1.72	17.08-16.03	31.82-50.55	37.68-51.83	3.19-2.55	4366.33-4512
	VI	12.87-12.64	5.28-5.51	9.14-9.59	1.52-1.57	19.68-19.34	23.63-23.72	25.55-27.24	3.29-3.21	3017.33-3228
	XII	≤ 12.34	≥ 4.60	≥ 8.61	≥ 1.51	≤ 21.15	≥ 21.82	≥ 21.04	≤ 3.17	≥ 2943

Conclusions

The longitudinal study has highlighted the possibility to reach performance patterns necessary for predicting training in the combined events of junior athletes in athletics.

The analysis of the results recorded in the outdoor competition seasons highlighted the following:

- from 2003 to 2012 inclusively, the competition program consisted in the combined event of five events (pentathlon) in girls and of seven events (heptathlon) in boys and from 2013 to 2015, of six events (hexathlon) in girls and of eight events (octathlon) in boys, therefore the design was changed by the Romanian Athletics Federation regarding training at this age, namely introducing the hexathlon and octathlon as combined events since 2013;

- there are big differences in obtaining performance in each event separately and in the overall score, so there are differences from year to year, given by the value of the human material involved in the training process;

- the results depend mainly on the athletes' predispositions regarding the skill level, meaning that those who are speedy get good results at the explosive-type group of events, those who have endurance do well in the endurance group of events;

- the hypothesis according to which "the analysis of the performance recorded by the athletes aged 14-15 over a period of 13 years, in the combined events helps us reach its pattern" was confirmed;

- two performance patterns were developed: one for junior girls and one for junior boys;

- in reaching the performance patterns, we established reference results for each event separately, but also for the general score the values ranging between the arithmetic mean and the best performance recorded at each level.

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