Trakia Journal of Sciences, Vol. 19, Suppl. 1, pp 641-653, 2021

Available online at:
http://www.uni-sz.bg

ISSN 1313-3551 (online) **doi:10.15547/tjs.2021.s.01.099**

MACROSTRUCTURAL DISTRIBUTION OF THE BASIC TRAINING TOOLS FOR CLASSIC MOUNTAIN RUNNING IN A COMBINED MODEL OF PREPARATION FOR "MAINLY UPHILL" AND "UP AND DOWNHILL" VARIANTS

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ABSTRACT

The article represents research on the distribution of the basic training tools in the annual cycle of highly qualified racers in mountain running in a combined preparation focused to racings in both variations "Mainly Uphill" and "Up and Downhill". The aim of the research is differentiation of a principle model of the weekly distribution of the basic training tools in the macrostructure.

Following methods were used: a) research of the weekly volume of the training tools within the framework of the separate mezzo-cycles in the macrostructure and b) variation analysis of the data received from the training tools explored.

The results from the research show, that the main part of the auxiliary running tools for the sub-factors from second level are focused to the development of the pace endurance. The most significant sub-factor from second level – pace endurance is developed by running without denivelation, mainly in the preparation period. The biggest portion of the training workout is related with development of the sub-factor from third level "basic endurance". It appears to be the fundament, on which the whole structure of the training is developed.

Key words: Mountain running, Trail running, Off-road running, Achievement factors, Classification of the training tools, Basic training tools, Model of annual periodization.

INTRODUCTION

Sport preparation of the highly qualified mountain runners contains a great diversity of training tools. In our previous research they are classified in details according to their focus to the separate factors of the sport achievement, but in general they are divided in specific and basic (1, 2). Specific training tools coincide or are very close in biomechanics and bioenergetics to the competition. Basic tools significantly differ from the so called „competition exercise". Those are supportive tools for development of the sub-factors from on flat, running in difficult conditions, special second and third level. They include running running exercises, speed-strenght jumps, multi-jumps, exercises with weights, complex exercises for strength, exercises for coordination, balance and flexibility. That diversity of training tools takes big portion from the training volume and is used for supporting the main goals of the training (**Table 1 and Table 2**).

Purpose of the research is defining of a principle annual model of distribution of the volume of the basic training tools per weeks in a focused combined preparation for competition variants „mainly uphill" and „uphill and downhill" in the classical mountain running.

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Table 1. *Supporting training tools for development of the second level subfactors , the bioenergetic regime and the conditions under which they are performed.*

Subfactors from second level	Bioenergy Regime	Supporting training tools	Terms of performance
Pace endurance	3.Aerobic-anaerobic regime	1. Control racing running 2. Paced extensive (interval) running 3. Long variable running (Fartlek) 4. Intensive long running	11. Plain terrain
	2.Aerobic regime-2	5. Aerobic developmental running 6. Aerobic building running	
Strength endurance	3.Aerobic-anaerobic regime	9.Strength running 10. Jumps and multi-jumps in difficult conditions 11. Exercises with weights and strength complexes	12. Various motor activities with weights or in difficult conditions
Speed-strength potential	5. Anaerobic-non lactate regime	7. Repeat running 8. Interval - paced intense running 12. Speed-strenght jumps and multi-jumps	11. Plain terrain

Table 2. *Supporting trasining tools for development of the third level subfactors , the bioenergetic regime and the conditions under which they are performed.*

Subfactors from third level	Bioenergy Regime	Supporting training tools	Terms of performance
Basic endurance	1.Aerobic regime-1	14. Aerobic support running 15. Aerobic compensatory running 16. Other sports	13. Various conditions
Strength	5. Anaerobic-non lactate regime	11. Exercises with weights and strength complexes 17. Short horizontal and vertical jumps	13. Various conditions
Speed	5. Anaerobic-non lactate regime)	13. Special running exercises 18. Sprint running	13. Various conditions
Coordination and flexibility	5. Anaerobic-non lactate regime	19. Balance and coordination exercises 20. Stretching exercises	13. Various conditions

METHODS

Tasks of the research:

1. Defining of the volume of basic training tools in the macrostructure and their implementation per factors and sub-factors of achievement.
2. Analysis of the distribution of the basic training tools per weeks in the framework of the macrostructure.
3. Conclusions.

Object of the research is the training and sport-racing activity in the mountain running, and **subject** are the basic training tools, used in the preparation of the mountain runners.

Scope of the research are 29 training programs of mountain runners

Methodology of the research includes:

1. Analysis of the scientific-methodology literature for long running and mountain running.
2. Research of the weekly volume of the training tools in the framework of the separate mesocycles in the macrostructure of the training programs of the runners.
3. Variation analysis of the data from the training tools in the macrostructure.

One part of the research literature sources are looking at the problems of the specialized diversity of the training tools (3, 4), other part are looking at the specific of the racing courses in the mountain running (5, 6) and training methodology (7-15). 29 training programs have been researched of a highly qualified mountain runners.

RESULTS

Analysis of the basic running training tools

Table 3. *Average values of the weekly volume of the basic running training tools in the researched training programs.*

Weeks	Basic running training tools					
	Supporting running tools from second level			Supporting running tools from third level		
	Pace endurance	Strength endurance	Speed-strength potential	Basic endurance		Speed
	Distance in km	Distance in km	Distance in km	Distance in km	Displacement	Distance in km
1	3			60	1950	1
2	5			65	2170	1
3	6		1	70	2410	2
4	5	1	2	80	2520	3
5	5	1	1	85	2580	4
6	10	2	3	90	2810	2
7	12	3	3	90	2820	4
8	5	2	2	85	2810	3
9	5	2	4	80	2830	2
10	4	1	3	78	2850	4
11	7		4	85	2860	2
12	10		3	90	2750	3
13	13			70	2680	2
14	10			85	2620	3
15	14			80	2490	3
16	7			75	2460	4
17	10			80	2540	3
18	5		3	85	2510	1
19	6		4	80	2570	2
20	12		4	85	2520	3
21	5		2	80	2510	2
22	10			80	2560	1
23	13			85	2470	3
24	11			80	2310	2
25	3			75	2280	2
26	5			70	2110	2
27	6			75	1950	1
28	2			65	2130	1
29	1			70	2140	1
30	7			75	2100	1
31	2			70	2030	1
32	2			70	1630	1
33	1			75	1430	1
34	6			65	1360	1
35	2			65	1240	1
36	0			50	1120	1
37	0			75	1000	1
38	1			70	900	1
39	0			50	900	1
40	2			65	1360	1
41	3			65	1350	1
42	0			60	1370	1
43	2			65	1400	1
44	1			55	1420	1
45	1			50	890	0
46	4			55	670	0
47	2			50	680	0
48	1			50	860	0
49	2			55	1440	1
50	18			50	1790	1
51	1			40	1970	1
52	2			50	1890	1
Total	270	12	39	3653	103010	86

Analysis of the annual volume of the basic running training tools

Data received shows that, the annual volume of the basic running tools is 4060 km, with 90% from them are from running developing the sub-factor from third level „basic endurance“ (**Figure 1**). The other sub-factor from third level – „ speed“ has annual volume of 86 km, which is at least 2%. Running for the sub-factor from second level „pace endurance „ is 270 km or 7%, and for „strength endurance“ and „speed-strenght potential“ are in total below 2%.

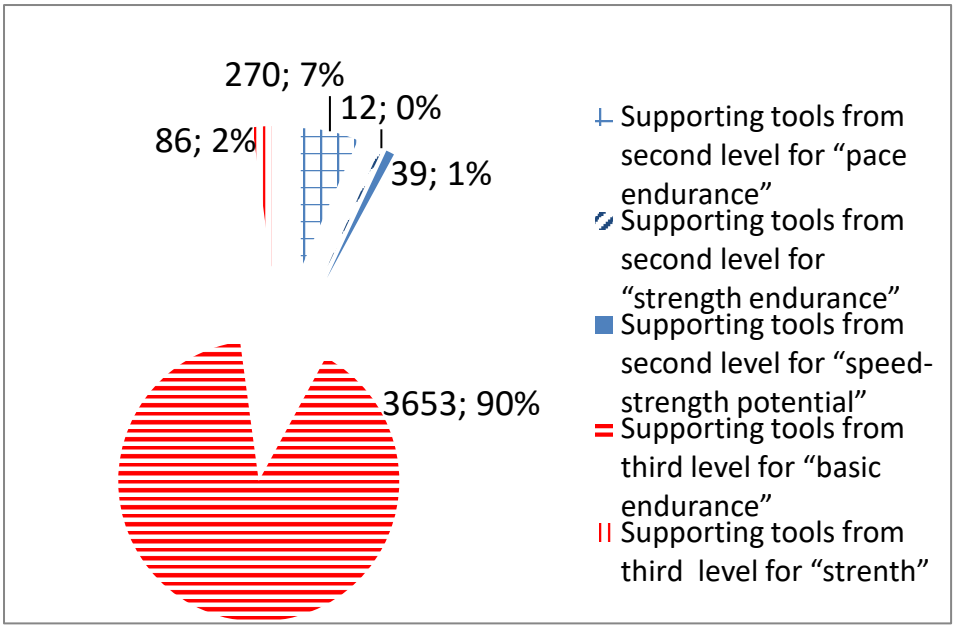

Figure 1. Annual volume of the basic training tools.

Analysis of the supporting running tools for sub-factors from II^{-nd} level

Analysis of the supporting running tools focused to the sub-factors from second level (**Figure 2**) shows, that 80% from running volume is directed to the development of pace endurance, 5% for strength endurance and 15% to speed-strength potential.

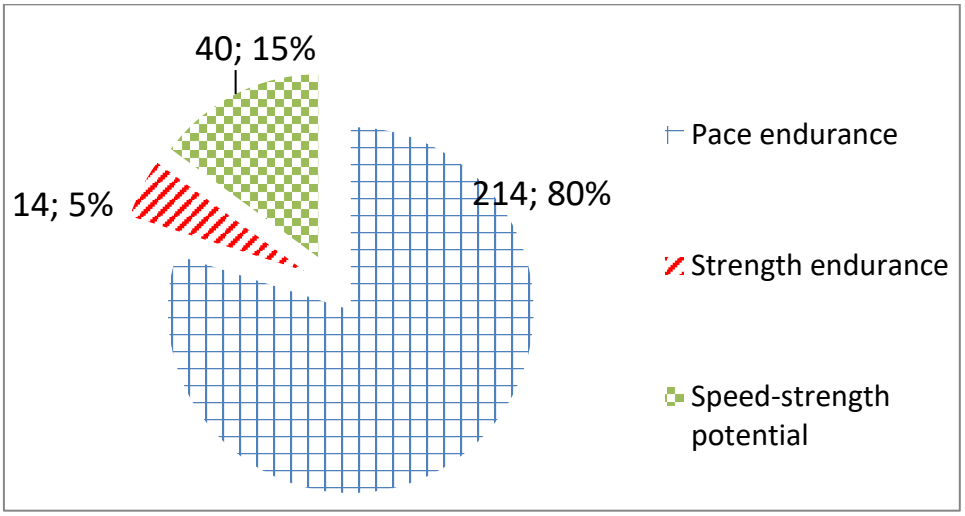

Figure 2. Ration of the annual volume kilometers in the supporting running training tools.

Analysis of the distribution of the volume of the supporting running tools for the sub-factors from II^{-nd} level per weeks in the macrocycle

The pace endurance is developing through running on flat surface, with intensity close to the competition one, mainly in the preparation period, and during competition and transient period these training tools have minimal volume (**Figure 3**). Annual volume is 214 km (**Figure 2**).

Strenght ednurance is developing through the so called strength running in more difficult conditions mainly during general preparatory period with total volume 14 km (**Figure 3**).

For speed-strength potential are used interval running on flat surface, allocated in the basic mesocycles of the general preparatory and special preparatory stage (**Figure 3**), with total volume of 40 km (**Figure 2**).

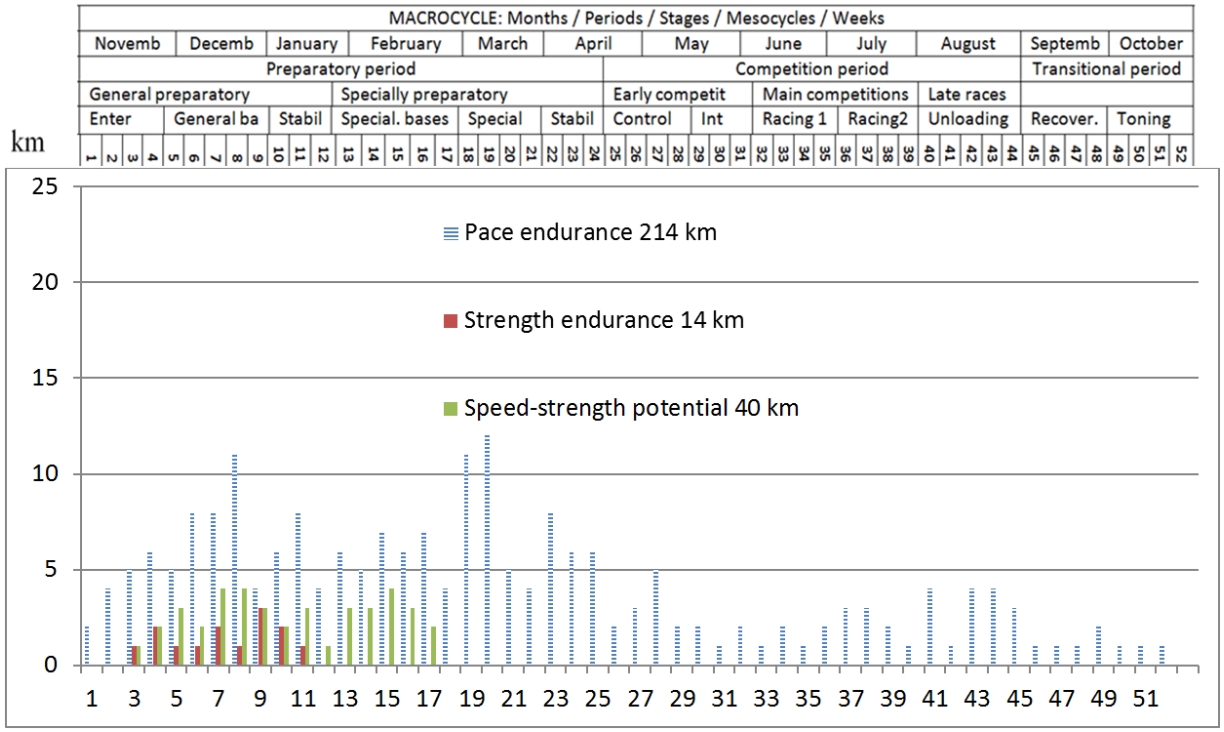

Figure 3. In the framework of the macrocycle at the abscissa is shown the weekly distribution of the volume of running tools for the sub-factors from second level.

Analysis of the supporting running tools for the sub-factors from III-rd level

Data received shows that, the biggest portion of the training work is related with the sub-factor „basic endurance“. It appears to be the fundament, above which the whole structure of the training is developed. The ratio of the volume of the running for basic endurance and speed is 49 to 1 (**Figure 4**).

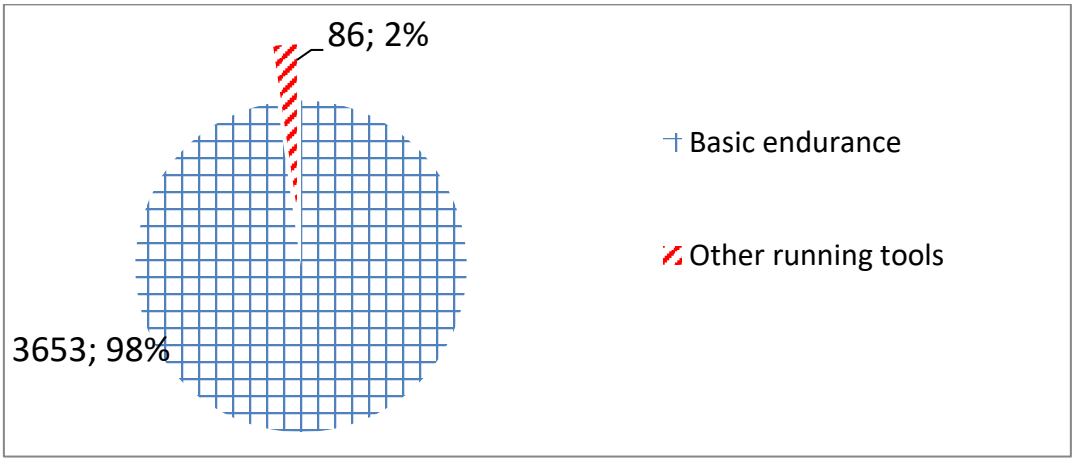

Figure 4. Annual volume of kilometers of the supporting training tools from third level.

The supporting running tools for development of the basic endurance take 71% from total annual running volume (**Figure 5**).

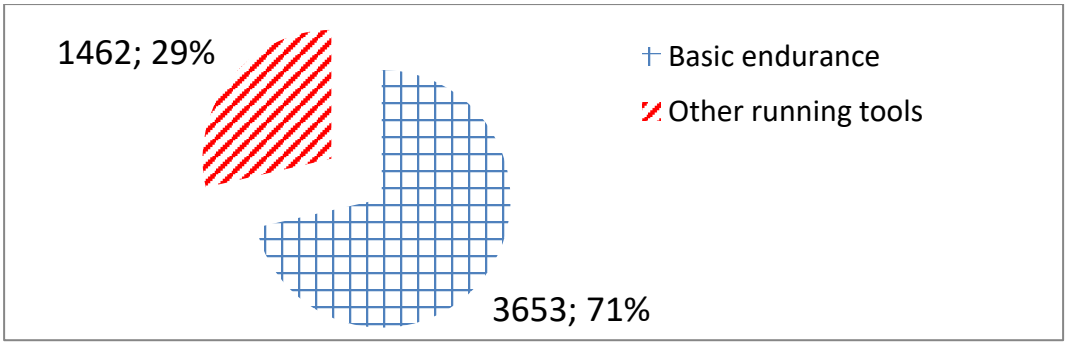

Figure 5. Comparison of the volume kilometers of the tools for basic endurance to the total running volume of the rest running tools.

Total volume of running workout for "basic endurance" is 3653 km with positive and negative denivelation from 103010 meters. The weekly volume is in the range of 50 km during transient period, to 90 km with up to 3000m positive and 3000m negative denivelation during preparation period (**Figures 6 and 7**).

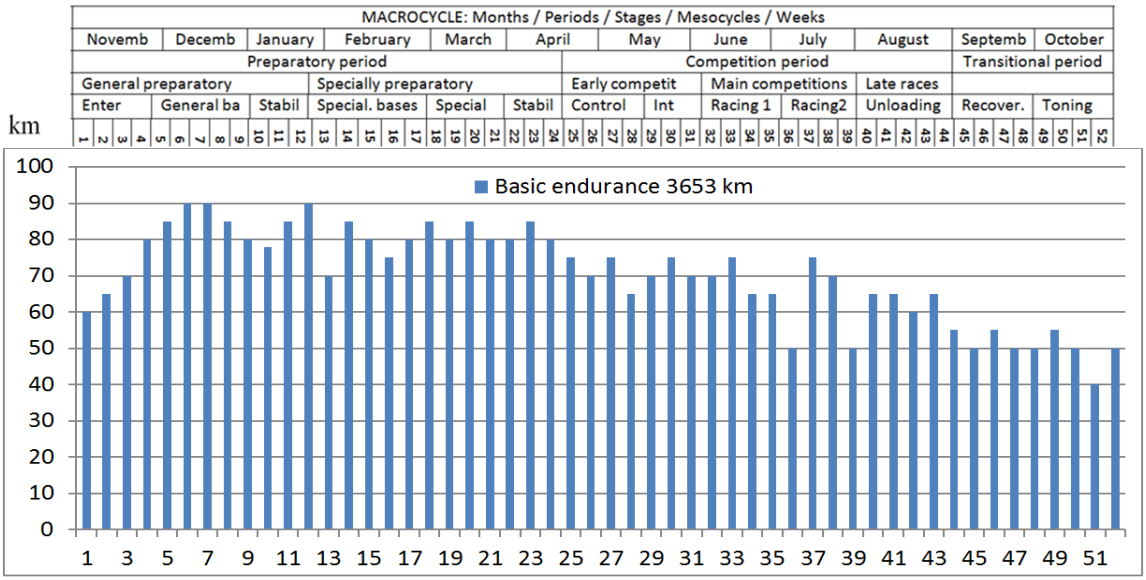

Figure 6. In the frame of macrocycle on the abscissa is shown the weekly distribution of the kilometers for basic endurance.

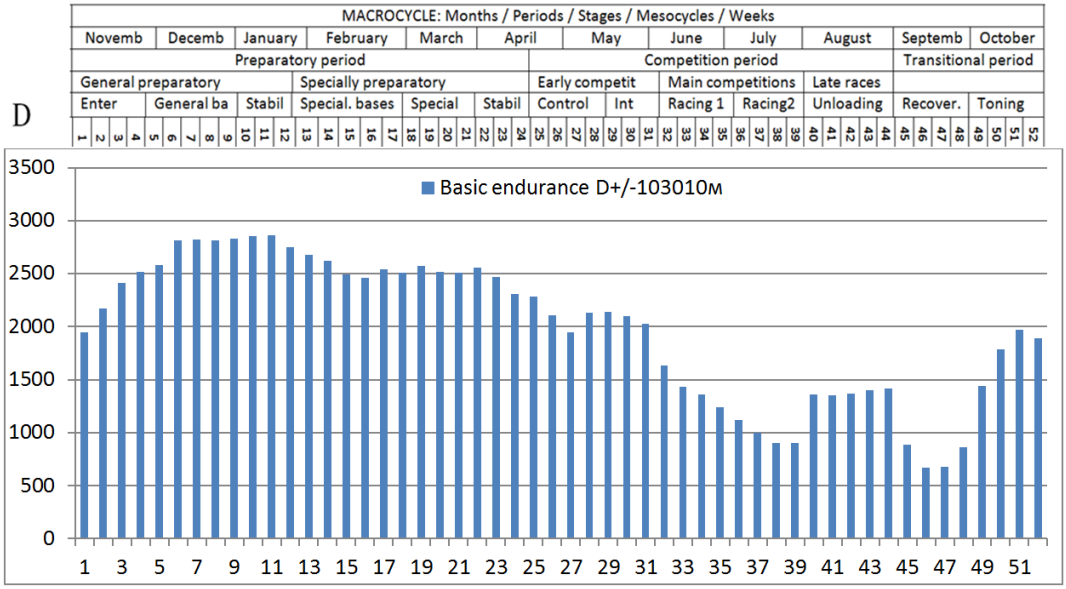

Figure 7. In the frame of the macrocycle on the abscissa is shown the weekly distribution of meters denivelation fof basic endurance.

Volume of the running tools for development of the factor „speed“ is distributed almost equally during all stages of the preparation. A bit higher levels have the sprint running during first half of the special preparatory stage and lower during second half of the competition period. Only in the first half of the transient period the work for that factor is interrupted **(Figure 8).** Annual volume is 86 km.

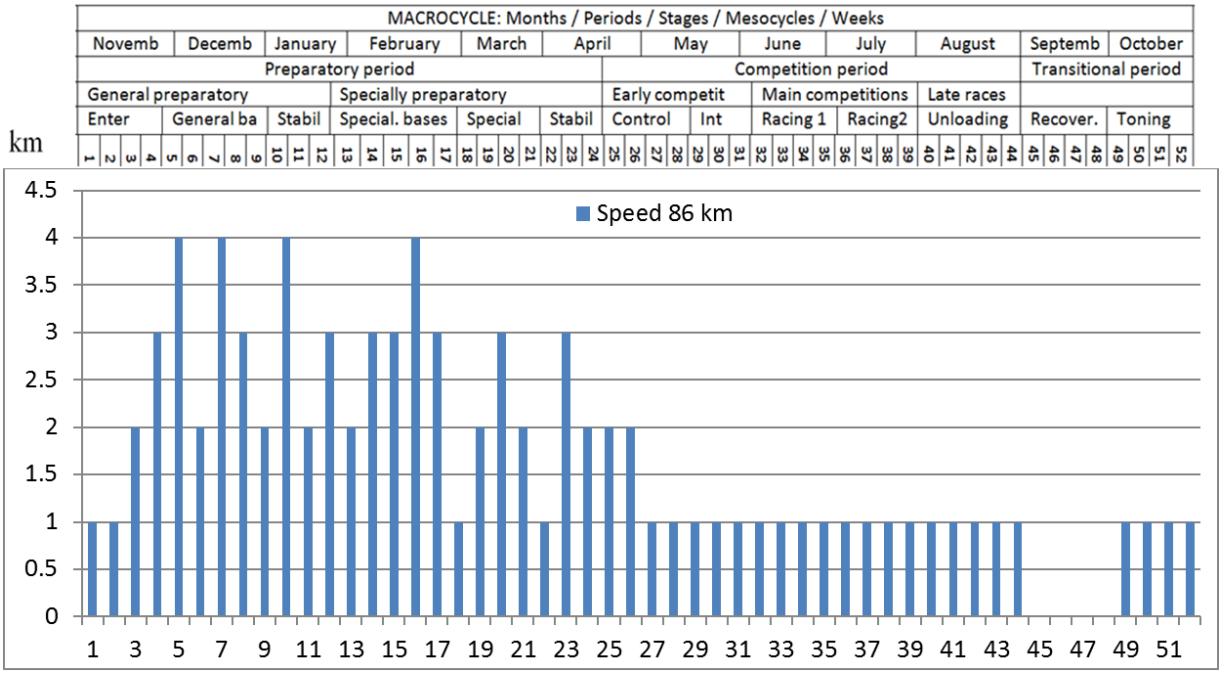

Figure 8. In the frame of macrocycle on the abscissa is shown the weekly distribution of the kilometers for speed.

Analysis of the basic non-running tools

Table 4. *Average values of the weekly volume of the basic non running training tools in the researched training programs.*

Weeks	Basic non-running training aids					
	Supporting non-running tools from second level		Supporting non-running tools from third level			
	Strength endurance	Speed-strength potential	Basic endurance	Strength	Speed	Coordination and flexibility
	Minutes	Minutes	Minutes	Minutes	Minutes	Minutes
1	12	5	200	16	6	95
2	18	5	180	19	7	93
3	14	4	200	18	7	90
4	28	6	200	21	8	115
5	35	8	250	19	11	93
6	32	14	240	17	8	111
7	33	18	260	20	9	114
8	32	6	270	20	8	95
9	38	5	240	19	10	90
10	35	22	240	18	10	110
11	36	15	250	16	12	105
12	35	11	210	17	11	102
13	25	6	130	14	13	91
14	25	21	110	18	12	90
15	20	17	90	17	12	105

16	0	12	70	14	11	110
17	13	4	60	17	13	114
18	10	6	50	6	10	113
19	5	20	60	4	11	111
20	7	5	50	7	12	110
21	7	5	40	7	12	100
22	5	22	50	4	12	105
23	8	2	40	3	10	90
24	10	3	40	2	11	113
25	4	5	10	2	13	110
26	10	2	10	3	8	120
27	9	2	10	2	12	135
28	2	8	0	4	9	135
29	5	1	0	3	11	150
30	5	4	10	2	10	150
31	3		0	5	11	145
32	5		0	3	9	150
33	5	1	10	2	12	152
34	0	7	0	3	13	142
35	5		0	2	9	151
36	2		10	1	11	140
37	5	1	20	2	8	134
38	5		0	1	13	140
39	1		0	2	12	150
40	4		10	1	6	140
41	5	3	0	5	9	152
42	3		10	6	5	133
43	5		10	5	4	121
44	4	3	0	2	4	121
45	4		90	5	3	110
46	5		110	3	4	120
47	3		100	5	4	112
48	5	1	110	6	5	124
49	3		200	5	6	120
50	7	1	170	3	5	102
51	8	1	200	5	3	93
52	7	2	210	3	5	90
Total	612	284	4830	424	470	6107

Analysis of the annual volume of the basic non-running training tools

At **Figure 9** it can be seen the ratio of the volume training tools directed to the sub-factors from 2-nd and 3-rd level. Naturally 86% from the duration is distributed for development of the sub-factors „basic endurance“ and „coordination and flexibility“, because the used training tools are with highest intensity.

To the sub-factors „strength endurance“, speed-strength potential“, „strength“ and „speed and speedy abilities“ are focused the most intensive training tools in ratio 5:2:3:4. Their total part is 14%.

Analysis of the supporting non running tools for sub-factors from II^{-nd} level

Sub-factors from II^{-nd} level „strength endurance“ and „speed–strength potential“ are developed with running and non running training tools. Annual volume of the non running tools for „strength endurance“ is 612 minutes, and for the sub-factor „speed-strength potential“ is 284 minutes. On **Figure 9** it can be seen the ration in the tools as follow: 32% strength endurance to 68% speed – strength potential.

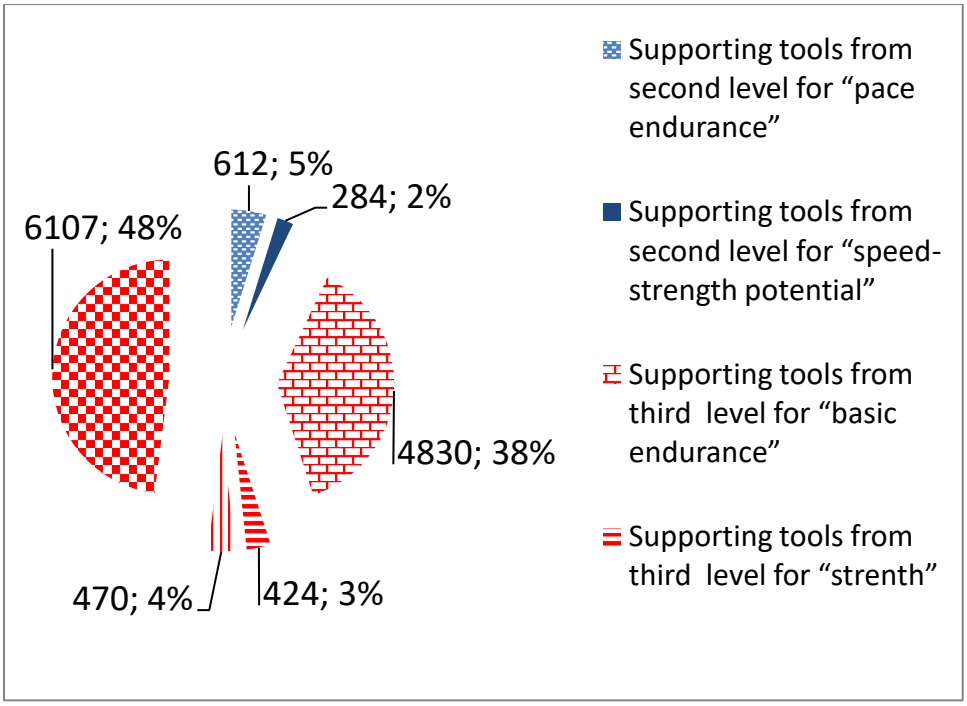

Figure 9. Annual volume in minutes of the basic non-running training tools

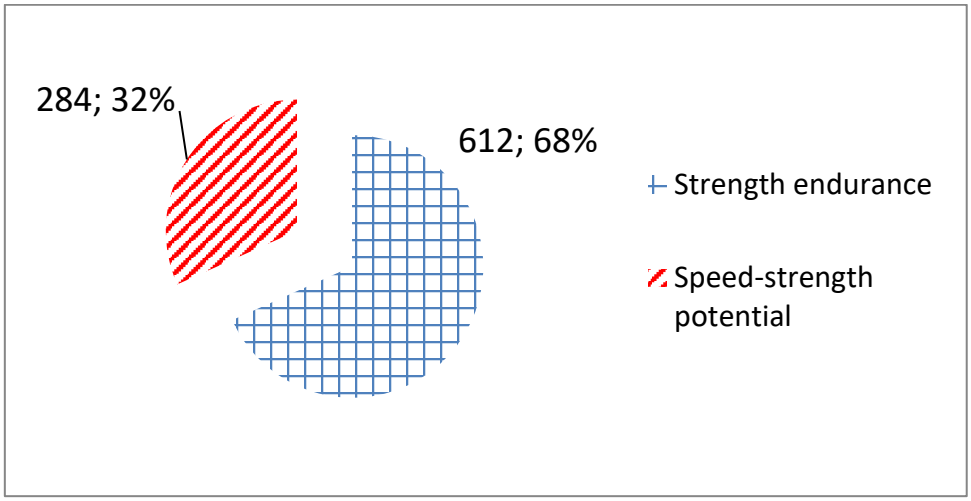

Figure 10. Annual volume of supporting non-running tools for sub-factors from second level.

Jumping workout, strength complexes and exercises with weights are used for developing of strength endurance through the whole year. Total volume is 612 minutes **(Figure 10**). It has highest values in the general preparation stage and in the begging of the special preparation stage. After that in the special preparation stage, their volume significantly decreases, and in the competition period it has supporting strength endurance purpose **(Figure 11).**

Speed-strength jumps and multi jumps have total volume of 284 minutes. They are included periodically in the training process in the middle of the special preparatory stage till the stage of the late competitions. Complementing with the tools for the sub-factor „strength“ it is aimed supporting the sub-factor „speed-strength potential“ **(Figure 11).**

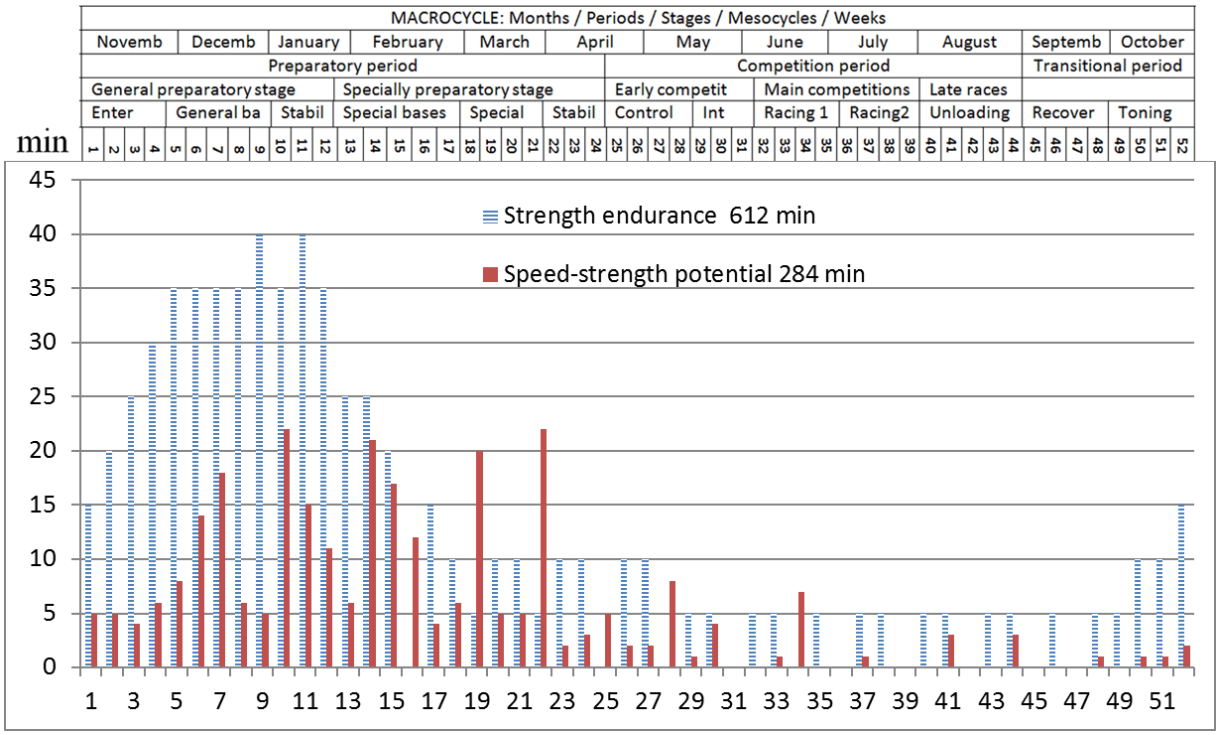

Figure 11. In the frame of macrocycle on the abscissa is shown the weekly distribution of the minutes of supporting non-running tools for sub-factors from second level.

Analysis of the supporting non-running tools for the sub-factors from III-rd level

Many of the tools for development of the sub-factors from third level are not running and have quite diverse character, due to which their comparison can be done with high dose of conditionalities. **Figure 12** represents, that with 4% and with duration around 450 minutes are the efforts for speed and strength, and the biggest portion time is divided between the total endurance, coordination and flexibility.

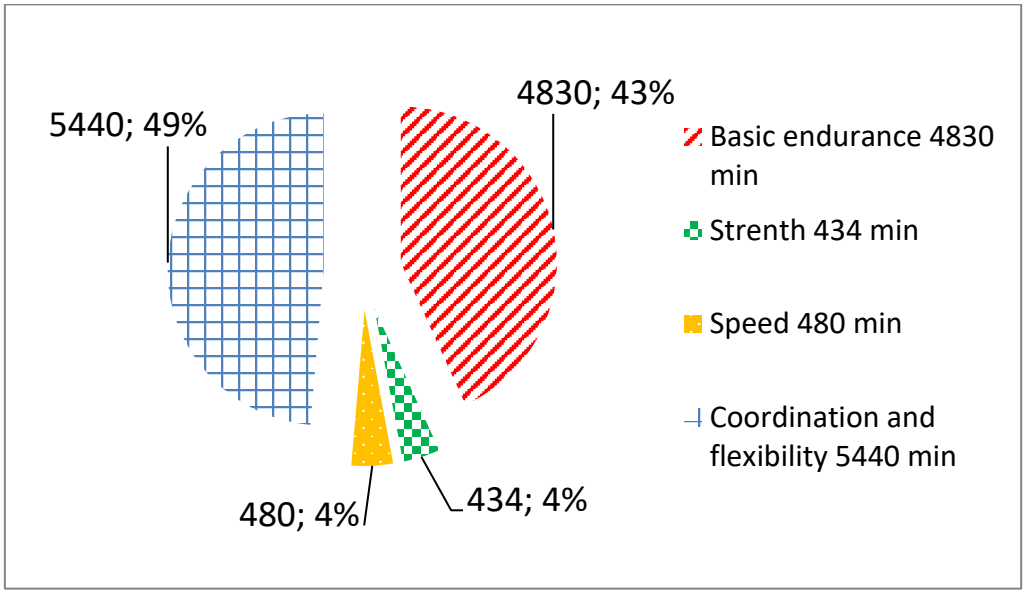

Figure 12. Annual volume in positive denivelation in minutes of the supporting non running tools for the sub-factors from III-rd level

Beside the huge volume running workout, for the sub-factor „basic endurance“ are included 4830 minutes for other sports and mobile games, and they are set mainly in the transient period, general preparatory stage and less in the special preparatory stage **(Figure 13).**

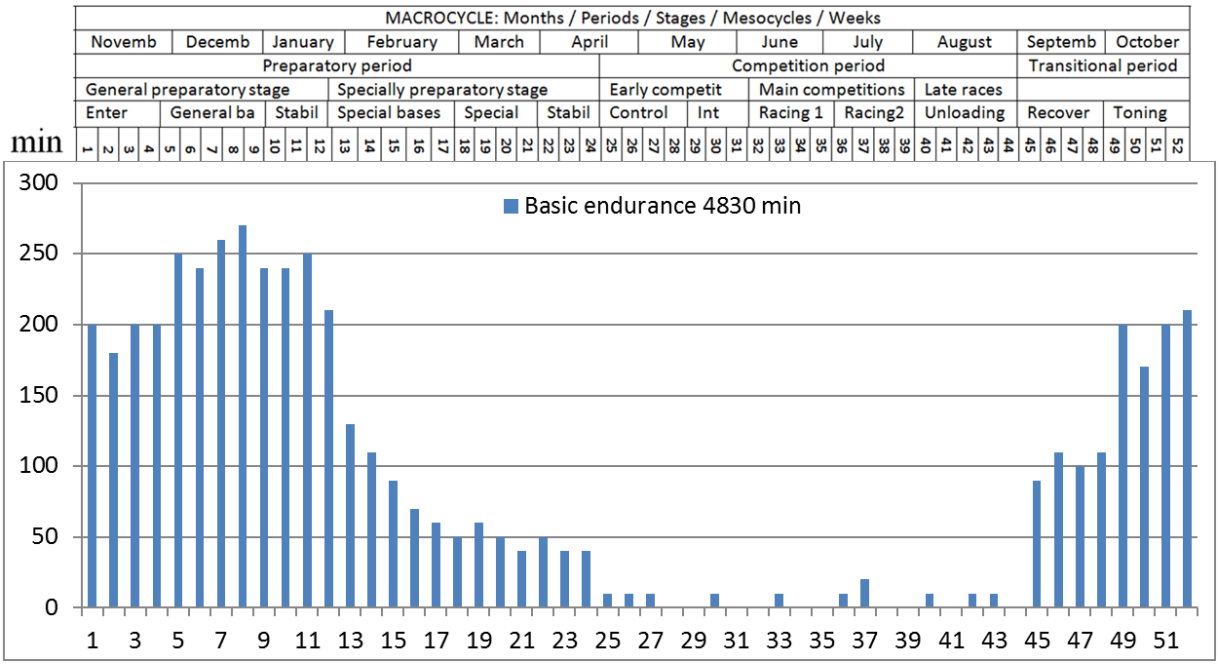

Figure 13. In the frame of macrocycle on the abscissa is shown the weekly distribution of the minutes of supporting non-running tools for basic endurance.

Tools for development of the factor „strength“ are the short horizontal and vertical jumps, strength complexes and exercises with weights. During general preparatory stage their volume is highest. During special preparatory stage they significantly decrease, and during competition and transient stage they have only supporting function. Their total annual volume is 434 minutes **(Figure 14)**.

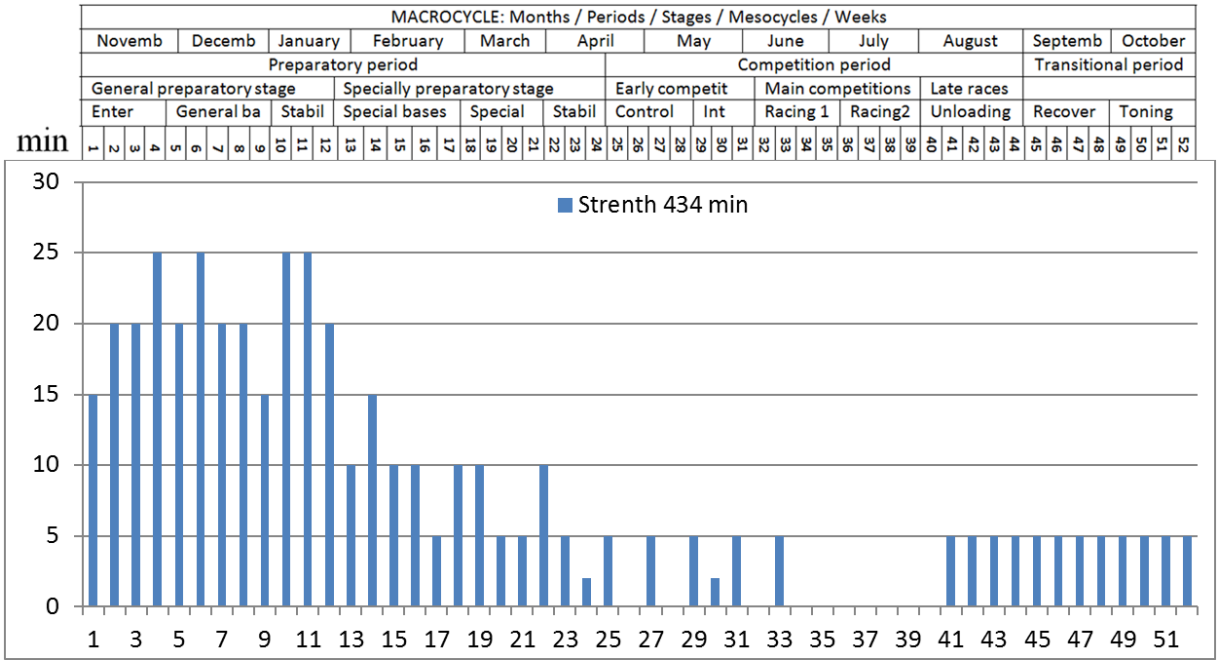

Figure 14. In the frame of macrocycle on the abscissa is shown the weekly distribution of the minutes of supporting non-running tools for strength.

Tools for development of the sub-factor „speed“ have total annual volume of 480 minutes. **Figure 15** represents how during general preparatory stage their volume is gradually increased. During special preparatory stage and in the competition period values of the volume are highest. But in the stage of the late competitions it significantly decreases, reaching minimal values, which stay minimal till the end of the transient period.

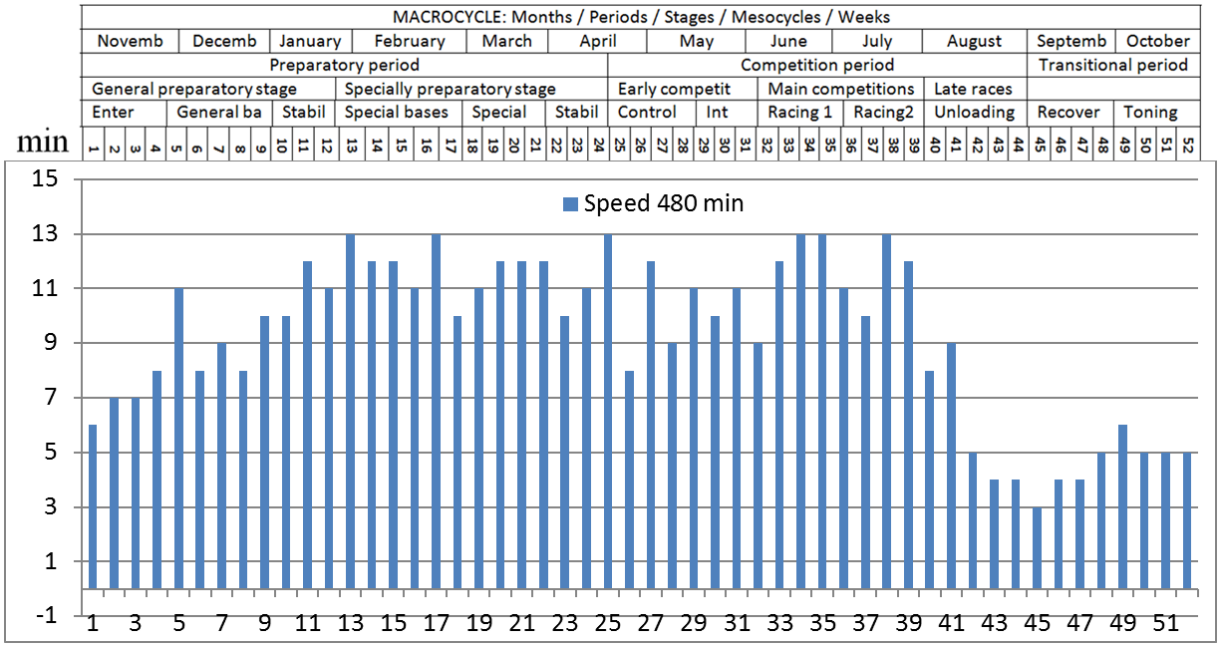

Figure 15. In the frame of macrocycle on the abscissa is shown the weekly distribution of the minutes of supporting non-running tools for speed.

In sub-factor „coordination and flexibility“ the tools are distributed almost equally during the whole year, and only in the competition period their longitude is increasing with 30 till 50% **(Figure 16).**

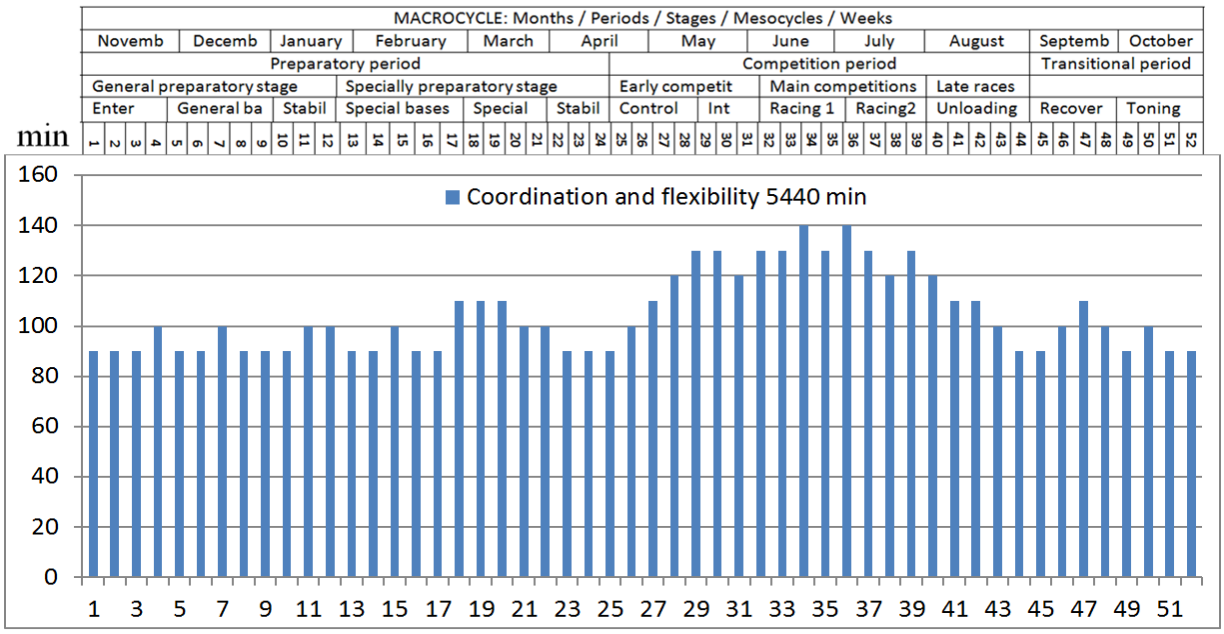

Figure 16. In the frame of macrocycle on the abscissa is shown the weekly distribution of the minutes of supporting non-running tools for coordination and flexibility.

CONCLUSION

1. Main part of the supporting running tools for the sub-factors from second level are directed to the development of the pace endurance.
2. The most significant sub-factor from second level – pace endurance is developed thought running on flat surface, with intensity close to the competition one, mainly in the preparation period.
3. From the supporting tools directed to the development of the sub-factors from third level, biggest portion from the training workout is related with the sub-factor basic endurance. It appears to be the fundament, based on which the whole structure of the training is built.

RECOMENDATIONS FOR THE SPORT PRACTICE

1. It is recommended that the ratio of the specific tools (developing the main factors and the sub-factors from first level) to the basic running tools (developing sub-factors from second and third level) is approximately 1:4.
2. Many of the tools for development of the sub-factors from second and third level are not running and have quite diverse nature, due to which their distribution in the preparation should be compliant mainly with the bioenergetics regimen of their performance.

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