Analyzing the performance of the national team members in the sport of orienteering

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Abstract
Objective: Competitors in the sport of Orienteering must be able to race through different types of terrain in the shortest time possible. This paper aims to analyze the performance indices in all types of Orienteering events for some of the best members of the National Orienteering Team during 2017.
Methods: The analysis was done based on statistical data collected from 24 National Team members using the WinSplits software.
Results: The distribution of the performance indices differ throughout a competition and especially between different competitions and it is tightly correlated with the competitive experience in similar terrains. A higher training volume in similar terrain leads to better performance during the competition. Competitors with very good results during trial events but with reduced exposure to training in similar terrain have recorded diminished consistency but significant improvement throughout a race or during multi day events on the same type of terrain.
Conclusions: Orienteers' performance can be improved by monitoring the indices that show which types of terrain are challenging and which are more suitable for them.
Keywords: performance indices, orienteering, consistency

Introduction

In the sport of Orienteering, the competitive results will be directly correlated to the amount of training put in, which has to develop the athletes' abilities of navigating at a high rate of speed in unknown terrain while accurately reading the map. Time between controls, on the particular route chosen by the competitor, without technical mistakes, is given by the individual physical abilities of the athlete.
Currently, in all major Orienteering competitions electronic timing is being employed at every control and the WinSplits software is being used to collect and analyze the timing data at every control location.
The performance indicator is a measure of a competitor's speed in relation to the fastest competitors in the age class. For each section, this indicator is the ratio of the average time of the fastest 25% split times and an the competitor's own split time. The average time of the top 25% is taken instead of the best times so that the result is a more robust measure of the performance.
A runner's consistency is given by the standard deviation of the performance indices weighted by the length of the section. A low value is better, meaning consistent performance.
In this paper we analyze the performance of the National Orienteering Team members at various internal competitions during 2017 in terms of results consistency and performance indicators.
The diagram of the deterministic model of orienteering performance by Kris Jones and Mark Nixon [1]is shown in Fig 1

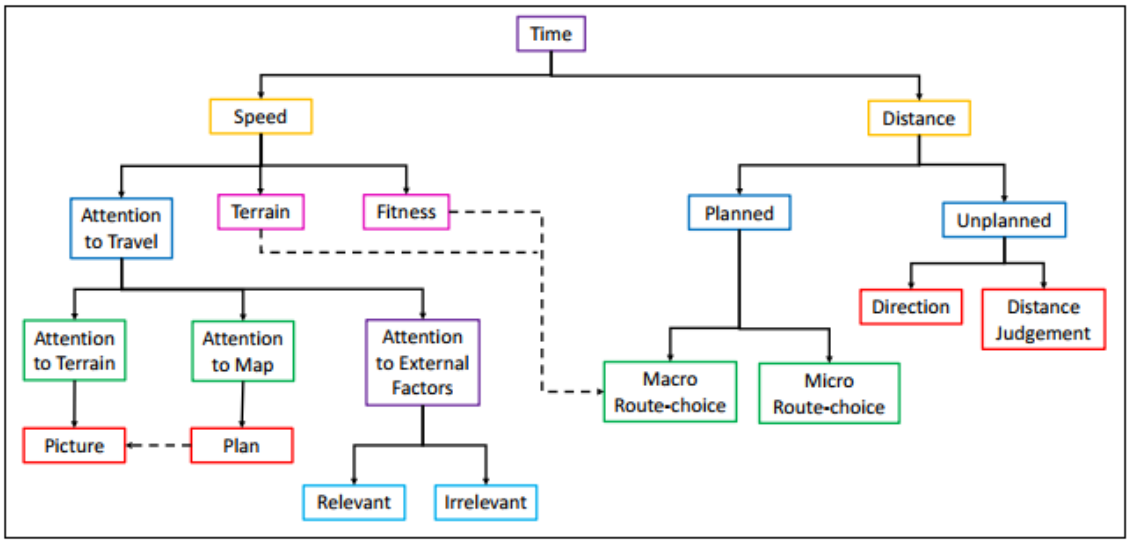


Fig.1 Deterministic model of orienteering performance

Methods and Data Source

Using the WinSplits software we analyzed a data source comprised of the results obtained by 44 athletes. Member of the National Team, in 10 major races in 2017: the national orienteering semi-marathon championship, team national championships in three stages – one medium distance race and two long distance races, individual national championships with sprint, long distance and medium distance races, Romania's Cup with two stages of medium distance and one long distance. The statistical details of the age and gender categories are shown in Figures 2 and 3.

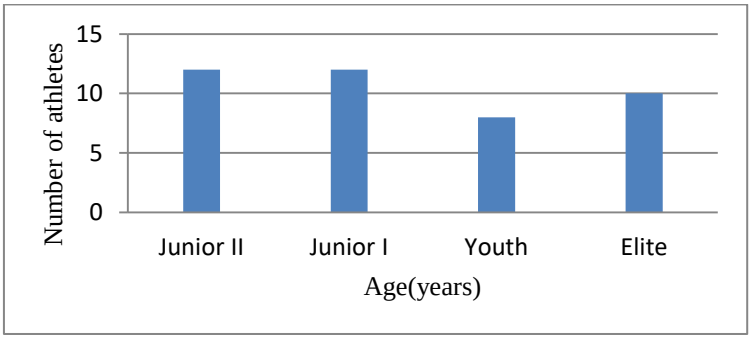


Fig 2 Statistical results by age categories

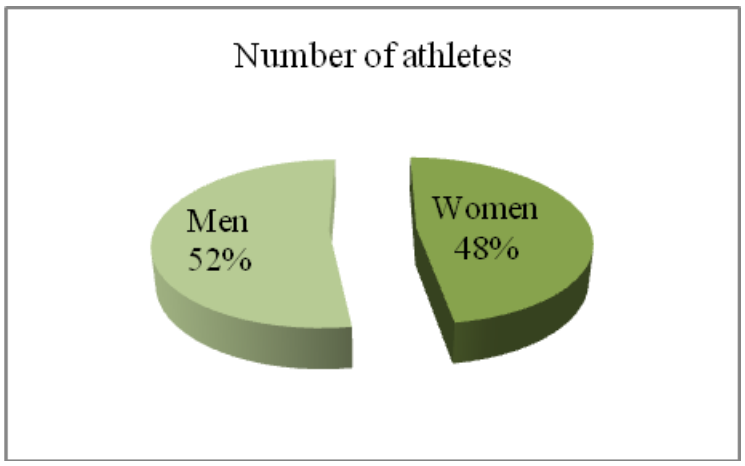


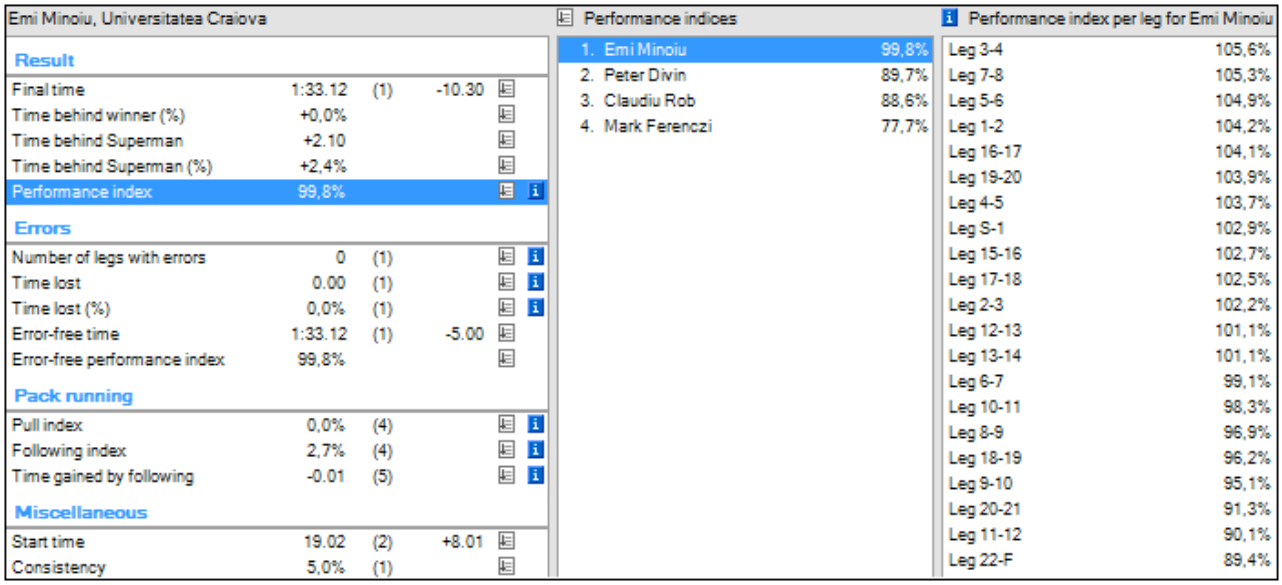
Fig 3 Statistical results by gender

Data Analysis

Athletes' performance will be analyzed based on the competition results. From this perspective, we will look to see if the analysis reveals differences in the athletes' evolutions in the endurance races (represented by long distance and semi-marathon races) and between races with a high degree of technical difficulty (represented by the medium distance races). The study is developed by interpreting the performance indices in races without technical difficulty, but with very fast decision-making orienteering represented by sprint competitions.

All athletes included in the study know from their coaches that previous research shows that the optimal strategy in endurance races is to adopt a uniform running pace that allows for minimal waste of energy (De-Koning, Bobbert, & Foster [2]; Foster, Snyder, Thompson, Green, Foley și Schrager [3]; Hawley [4]).

In the first national semi-marathon championship held in April 2017, the athletes knew at the start that they had to show that they had put in a great volume of training so they could deal with a race that in theory should last between 60 and 150 minutes (depending on age category and gender). Performance indices obtained by race winners range from 85.5% to 99.8% (see Table no.1 for the youth category, Table no.2 for the men elite category and Table 3-5 for the women category).



Emi Minoiu, Universitatea Craiova

Result			
Final time	1:33.12	(1)	-10.30
Time behind winner (%)	+0,0%		
Time behind Superman	+2.10		
Time behind Superman (%)	+2,4%		
Performance index	99,8%		
Errors			
Number of legs with errors	0	(1)	
Time lost	0.00	(1)	
Time lost (%)	0,0%	(1)	
Error-free time	1:33.12	(1)	-5.00
Error-free performance index	99,8%		
Pack running			
Pull index	0,0%	(4)	
Following index	2,7%	(4)	
Time gained by following	-0.01	(5)	
Miscellaneous			
Start time	19.02	(2)	+8.01
Consistency	5,0%	(1)	

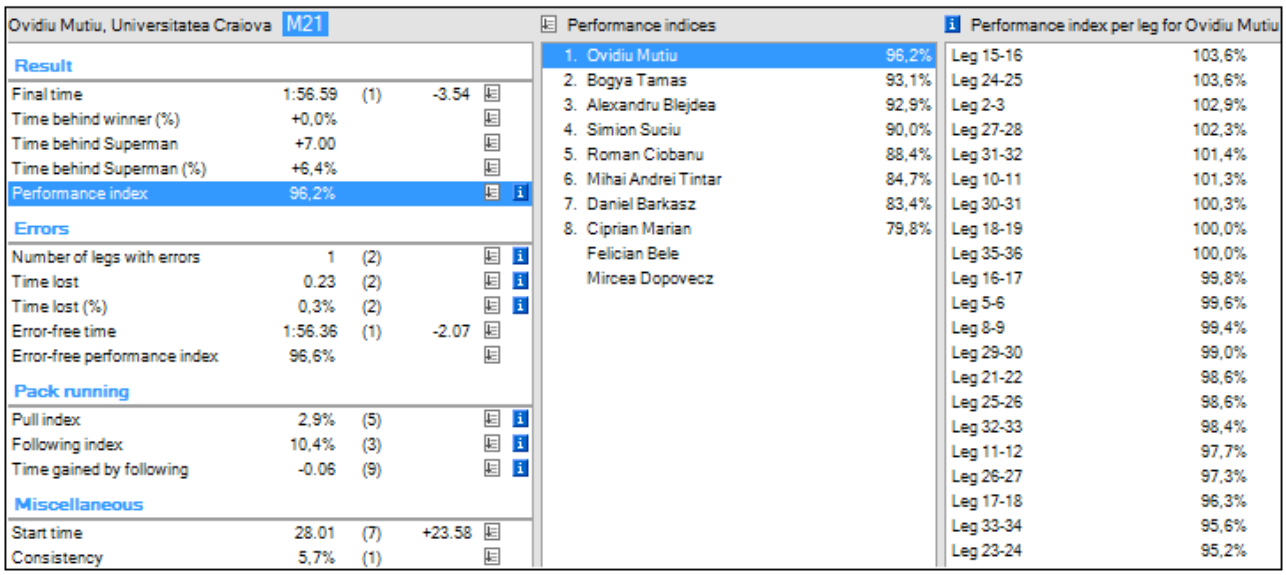
Performance indices

1.	Emi Minoiu	99,8%
2.	Peter Divin	89,7%
3.	Claudiu Rob	88,6%
4.	Mark Ferenczi	77,7%

Performance index per leg for Emi Minoiu

Leg 3-4	105,6%
Leg 7-8	105,3%
Leg 5-6	104,9%
Leg 1-2	104,2%
Leg 16-17	104,1%
Leg 19-20	103,9%
Leg 4-5	103,7%
Leg S-1	102,9%
Leg 15-16	102,7%
Leg 17-18	102,5%
Leg 2-3	102,2%
Leg 12-13	101,1%
Leg 13-14	101,1%
Leg 6-7	99,1%
Leg 10-11	98,3%
Leg 8-9	96,9%
Leg 18-19	96,2%
Leg 9-10	95,1%
Leg 20-21	91,3%
Leg 11-12	90,1%
Leg 22-F	89,4%

Table no.1. Performance indices obtained by race winners range – youth.



Ovidiu Mutiu, Universitatea Craiova M21

Result			
Final time	1:56.59	(1)	-3.54
Time behind winner (%)	+0,0%		
Time behind Superman	+7.00		
Time behind Superman (%)	+6,4%		
Performance index	96,2%		
Errors			
Number of legs with errors	1	(2)	
Time lost	0.23	(2)	
Time lost (%)	0,3%	(2)	
Error-free time	1:56.36	(1)	-2.07
Error-free performance index	96,6%		
Pack running			
Pull index	2,9%	(5)	
Following index	10,4%	(3)	
Time gained by following	-0.06	(9)	
Miscellaneous			
Start time	28.01	(7)	+23.58
Consistency	5,7%	(1)	

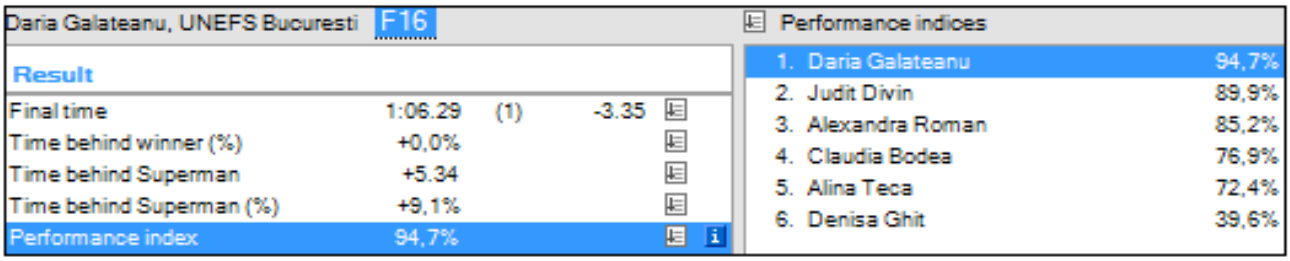
Performance indices

1.	Ovidiu Mutiu	96,2%
2.	Bogya Tamas	93,1%
3.	Alexandru Blejdea	92,9%
4.	Simion Suciu	90,0%
5.	Roman Ciobanu	88,4%
6.	Mihai Andrei Tintar	84,7%
7.	Daniel Barkasz	83,4%
8.	Ciprian Marian	79,8%
	Felician Bele	
	Mircea Dopovecz	

Performance index per leg for Ovidiu Mutiu

Leg 15-16	103,6%
Leg 24-25	103,6%
Leg 2-3	102,9%
Leg 27-28	102,3%
Leg 31-32	101,4%
Leg 10-11	101,3%
Leg 30-31	100,3%
Leg 18-19	100,0%
Leg 35-36	100,0%
Leg 16-17	99,8%
Leg 5-6	99,6%
Leg 8-9	99,4%
Leg 29-30	99,0%
Leg 21-22	98,6%
Leg 25-26	98,6%
Leg 32-33	98,4%
Leg 11-12	97,7%
Leg 26-27	97,3%
Leg 17-18	96,3%
Leg 33-34	95,6%
Leg 23-24	95,2%

Table no.2. Performance indices obtained by race winners range – men elite.



Daria Galateanu, UNEFS Bucuresti F16

Result			
Final time	1:06.29	(1)	-3.35
Time behind winner (%)	+0,0%		
Time behind Superman	+5.34		
Time behind Superman (%)	+9,1%		
Performance index	94,7%		

Performance indices

1.	Daria Galateanu	94,7%
2.	Judit Divin	89,9%
3.	Alexandra Roman	85,2%
4.	Claudia Bodea	76,9%
5.	Alina Teca	72,4%
6.	Denisa Ghit	39,6%

Table no.3. Performance indices obtained by race winners range – W16.

Dorottya Bartha, CS TranSilva Cluj	F18			Performance indices	
Result				1. Dorottya Bartha	97,3%
Final time	1:14.43	(1)	-4.37	2. Adela Galateanu	91,6%
Time behind winner (%)	+0,0%			3. Denisa Tamas	86,6%
Time behind Superman	+5.29			4. Bianca Stamate	70,0%
Time behind Superman (%)	+7,9%			5. Reka Mandel	64,0%
Performance index	97.3%			6. Denisa Tecar	62,0%

Table no.4. Performance indices obtained by race winners range – W18.

Andra Anghel, Universitatea Craiova	F21			Performance indices	
Result				1. Andra Anghel	97,9%
Final time	1:41.43	(1)	-2.00	2. Agnes Neda	96,1%
Time behind winner (%)	+0,0%			3. Yana Bogya	81,0%
Time behind Superman	+6.02			4. Roxana Culcean	76,1%
Time behind Superman (%)	+6,3%				
Performance index	97.9%				

Table no.5. Performance indices obtained by race winners range – women elite.

The standard deviation (consistency) ranges percentage wise between 11.5% - 32.9% for Junior II categories and 5.7% - 14.1% for elite categories.
The error rate is between 19.8% for Junior II categories and 8.1% for elite categories (see Table no).
In the Team National Championship held in May, most athletes have generally performed within the parameters shown above but noticeable is the impressive improvement of an athlete who has a performance index of 87.5% and a consistency of 5.7% in second stage (long distance event) and the next day reaches a performance index of 105.5% and a consistency of 1.4%. In the sprint stage of the National City Park championship held prior to the team championship, we notice a qualitative leap of the performance of the elite categories, the winning competitors having performance indices of 103.3% for Women and 103.6 for Men. Performance Indices for first four in the National Sprint are shown in Fig.4

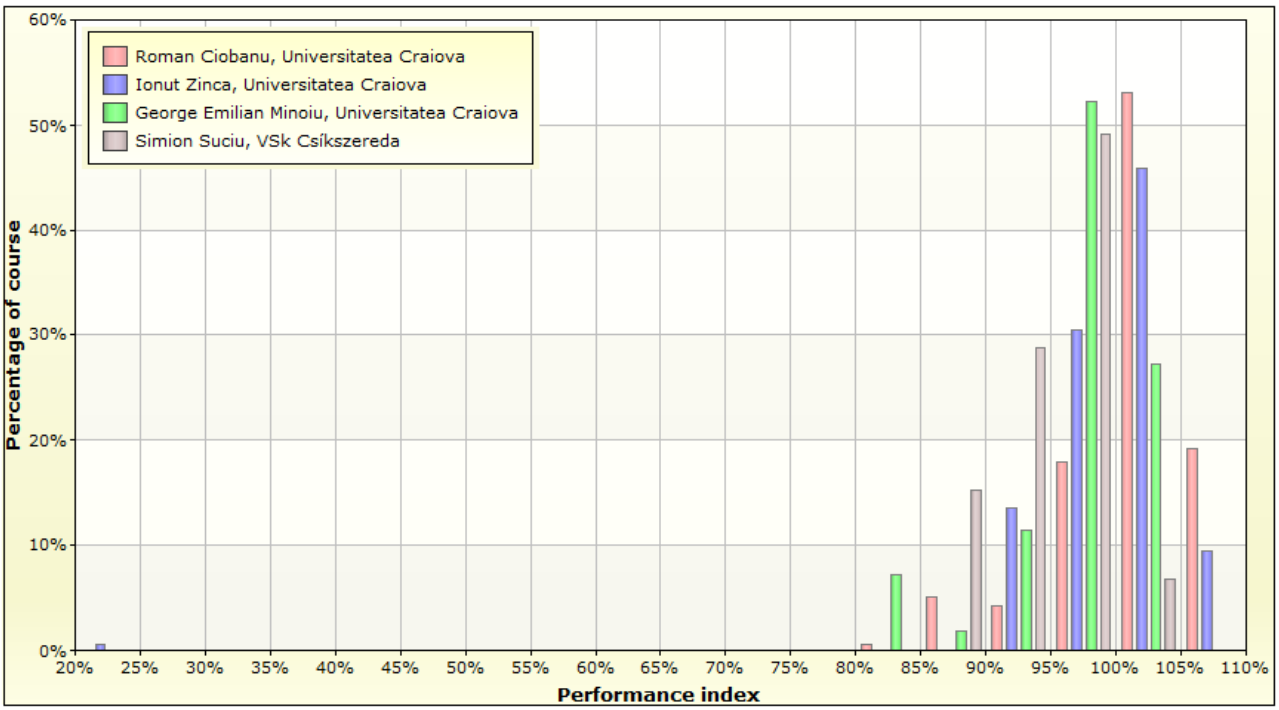


Fig.4 Performance Indices for first four places in the National Sprint_men elite class

+Fregvency leg placement during for the National Sprint Championships in men elite class are shown in Fig.5

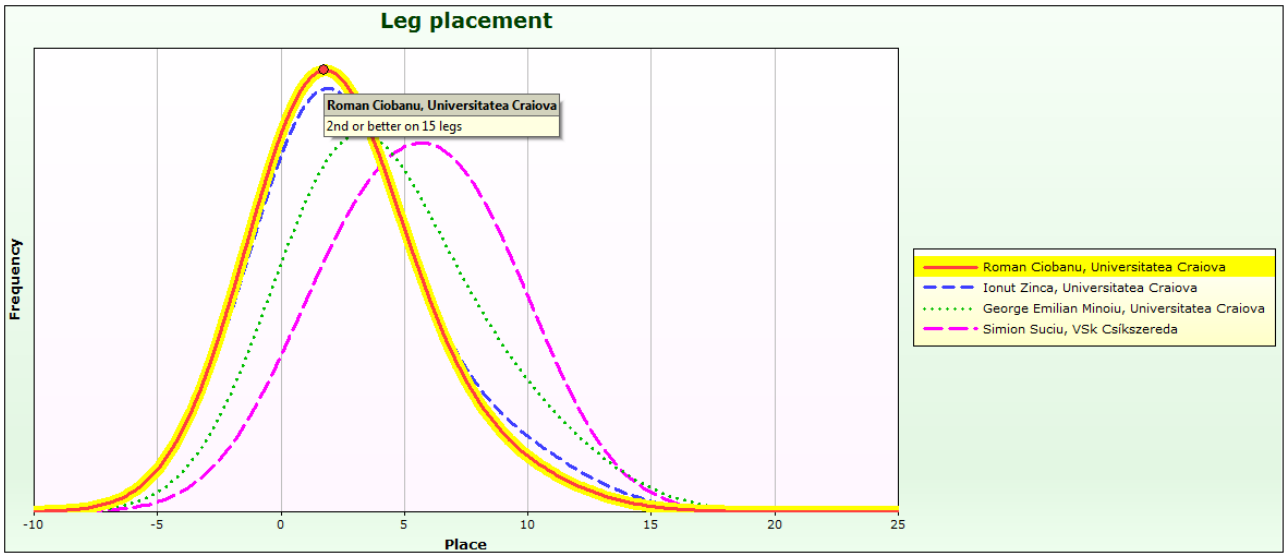


Fig.5 Fregvency leg placement for first four places in the National Sprint Championships-men elite class

Conclusion

The differences between performances of the Romanian National Team members in sprint, medium and long distance races are minimal, the supremacy being achieved by a limited number of athletes who dominate the championship. National teams include athletes who have good physical abilities and have systematically good races. Their performance indices are under an X% threshold and their goal is to increase their training volume to improve their ability to adapt the race speed to their map reading skills and navigate the terrain without deviation from the chosen routes.

Some National Team members have a consistency index below 6%, which indicates a constant performance throughout the race, but they fail to break into the top three spots. These athletes can only make progress if they increase their average race speed.

A distinct mention is warranted for the results obtained by a small number of athletes with low competitive experience who show significant improvement from day to day when the races are held on the same map. It is understandable that for them the increase in the number of competitions in as many different areas represents a way forward.

The analysis of performance indices, both on whole races and on sections of a race, is a basis that clearly illustrates in which areas the athletes can run unimpeded and on what types of terrain they need to improve their map reading skills.

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