

THE EVOLUTION OF ORIENTEERING ATHLETES TO NATIONAL YOUTH TEAMS IN INTERNATIONAL COMPETITIONS OVER A SHORT PERIOD OF TIME

Veronica MINOIU¹, Dorina Orțănescu², George Emilian MINOIU³

¹University of Craiova, Faculty of Physical Education and Sports, Romania

²University of Craiova, Faculty of Physical Education and Sports, Romania

³University of Craiova, Doctoral School of Social Sciences and Humanities

<https://doi.org/10.52846/jskm/40.2022.1.7>

Abstract

Orienteering athletes, in general, and the youngest in particular, can experience fluctuating performance over a short period of time, depending on the terrain conditions in which they compete. It is expected that athletes will perform better when competing in their home country compared to their results abroad.

Objectives: The purpose of this study is to analyze the performance of national junior orienteering teams over a short period of time and in different competition venues, with the aim of identifying factors that may contribute to fluctuations in performance and ways to promote stability and progress. This type of analysis can help teams identify their strengths and weaknesses and make adjustments to their training programs, strategies, and tactics to improve their results.

Methods: The results of 25 girls and 25 boys, aged 16 years (FM16 age category), who were members of national orienteering teams from SEEEOA (South East European Orienteering Association) member countries, were analyzed. The athletes competed in two competitions over a two-month period: the 2022 European Youth Orienteering Championship in Hungary and the 2022 South-East European Orienteering Championship in Romania. The common events from both competitions were included in the study: (1) the sprint event, with winning times ranging from 12 to 15 minutes, and (2) the long-distance event, with winning times ranging from 37 to 55 minutes. The analysis presented in the study is based on the performance indexes of the athletes in each event.

Results: Our results suggest that junior athletes should focus on strategies to avoid navigation errors and on technical training that familiarizes them with the competition field while improving their speed between checkpoints in different terrain and vegetation conditions.

Keywords: *junior athletes, the performance index, orienteering*

Introduction

Orienteering is a performance sport that entails navigating a pre-determined route through unfamiliar territory using a map and a compass. The goal of the sport is to locate checkpoints marked on the map in a specified order as quickly and effectively as possible. Orienteering is a multi-disciplinary activity that combines physical endurance with problem-solving, map-reading, and decision-making skills.

Orienteering in the context of the European Youth Championship is a competitive individual sport for young athletes aged 16 and 18 years. It involves navigating through unfamiliar terrain using a map and a compass to find a series of control points in the shortest time possible. The athletes competing in this championship are members of their respective national junior orienteering teams. The terrain can range from forests and hills to

urban areas and can include artificial fences in sprint competitions, making the sport challenging and exciting. Orienteering events can take various forms, including sprint, middle distance, and long distance, and are competed in individually. The sport tests an athlete's ability to navigate accurately and efficiently and to perform physically in challenging terrain. The European Youth Championship offers a unique and rewarding opportunity for these young orienteering athletes to showcase their skills and compete against their peers on a European stage.

The evolution of orienteering athletes to national youth teams in international competitions over a short period of time is a debated topic in the orienteering community (Bergström et al., 2021). Some argue that these athletes have the potential to improve quickly due to their young age, while others argue that consistency and experience play a

bigger role in success. Factors such as training, competition experience and mental preparation can influence performance and are important to consider when assessing the performance of young athletes in international competition. This debate highlights the importance of understanding the various factors that contribute to success in orienteering and the need for continued investment in the development of young athletes in the sport.

The current study aims to analyze the evolution of athletes from the national orienteering team, the W16 and M16 classes, who in 2022, over a short period of two months, participated in the European Youth Championship and the Southeast European Championship. The Romanian team was made up through the selection of athletes based on the arithmetic average of the best four results (percentage of the first place) from five selection competitions. The final result from the selection stages had a weight of 85%, while the stadium control test had a weight of 15% of the final value. Within the SEEOC, a ranking is compiled for nations and selectors and can include athletes who have consistency in their performance by fulfilling cognitive tasks but may have decreased chances for individual podiums due to their running pace.

The key aspect of orienteering as a performance sport is the combination of map-reading and navigation skills with physical endurance and agility, requiring participants to navigate through unfamiliar terrain using only a map and compass while running at a competitive pace (Bird et al., 2001; Creagh et al., 1997; Eccles et al., 2014; Galory et al., 1986., Guzman et al., 2008; Hebert-Losier et al., 2015).

Orienteering athletes face the challenge of handling both aerobic and anaerobic demands on uneven terrain that demands agility. At the same time, they need to plan, make decisions, maintain spatial perception and visuospatial attention, and engage mental representations associated with working memory (Batista et al., 2021).

It has been stated, through the analysis of performance in orienteering based on

cognitive aspects and physical preparation (Benedikt et al., 2019), that the times of amateur orienteers were 77-88% slower than when running the marked corridor routes on the optimal variant. The heart rate was on average 10 bpm lower in orienteering. Elite athletes, experts in the sport of orienteering, can make the difficult aspect of navigation between control points become easy, as they have developed a cognitive advantage (Eccles et al., 2015).

The analysis of the results of the orienteering competitions held over a period of two months refers to the study and evaluation of the athletes' performances during that timeframe. This analysis involves comparing the results of the athletes from the European Youth Championship and the South-East European Orienteering Championship, and identifies the trend in their performance. The analysis is based on performance indicators. The purpose of this type of analysis is to gain a deeper understanding of the athletes' strengths and weaknesses and identify areas for improvement. The information gathered through analysis can be used to make adjustments to athletes' programs, strategies and tactics in order to promote continued progress and success.

Orienteering athletes, in general, and younger ones in particular, can have sinusoidal developments in a short period of time, depending on the terrain areas where competitions are held and it is expected that the results of athletes will be superior when competing domestically compared to their results abroad.

Objectives

The current study aims to analyze whether the performance of national orienteering teams who participated in international competitions over a short period of time suffered significant fluctuations depending on the location of the competition, the training in this time interval and to identify methods for stability and progress. Ultimately, the aim is to support the development of the next generation of top orienteering athletes and continue to raise the level of competitiveness in the sport.

Hypothesis

A substantial reduction in the cognitive load of the race, due to familiarization with the competition areas, results in improved psychophysical states and improved performance.

Methods and Data sources

Since its first edition in 2011, the South-East European Orienteering Championship has been held every year after the Youth European Championship at an average interval of 8 weeks.

In this study, we will analyze to what extent the hierarchy value of the national teams in the 16-year-old youth orienteering category has been modified in the two 2022 competitions as a result of the training conducted during the eight weeks between the events. The analysis will be performed using GraphPad Prism 9.5.0 (730) software.

The results of 25 girls and 25 boys, aged 16 years (FM16 age category), who were members of national orienteering teams from SEEOA (South-East European Orienteering Association) member countries, were analyzed. The athletes competed in two competitions over a two-month period: the 2022 European Youth Orienteering Championships (EYOC) in Hungary and the 2022 South-East European Orienteering Championship (SEEOC) in Romania. The common events from both competitions were included in the study: (1) the sprint event, with winning times ranging from 12 to 15 minutes, and (2) the long-distance event, with

winning times ranging from 37 to 55 minutes. The analysis presented in the study is based on the performance indices of the athletes in each event.

To compare different races, the concept of a performance index has been adopted, defined as a measure of the runner's performance relative to the fastest runners in the class.

The performance index is a measure of a runner's performance in relation to the fastest runners in the class. For each leg, a quotient of the average of the 25% fastest split times and the runner's split time is calculated. These quotients are called performance indices. Using the average of the 25% best split times instead of just using the best split time produces a more robust measure. A performance index of 100% means, by definition, that the runner's split time is the same as the average of the 25% fastest split times on that leg. The higher the performance index, the better the performance. The performance index for the entire race is calculated as the quotient of the sum of the averages of the 25% fastest split times on each leg and the runner's result for the race (WinSplits Pro, split time analysis software). The performance index obtained by athletes at EYOC 2022 were calculated by referring only to the results of athletes from countries participating in SEEOC 2022.

Attaining a high-performance index in orienteering requires a combination of both running and navigation skills.

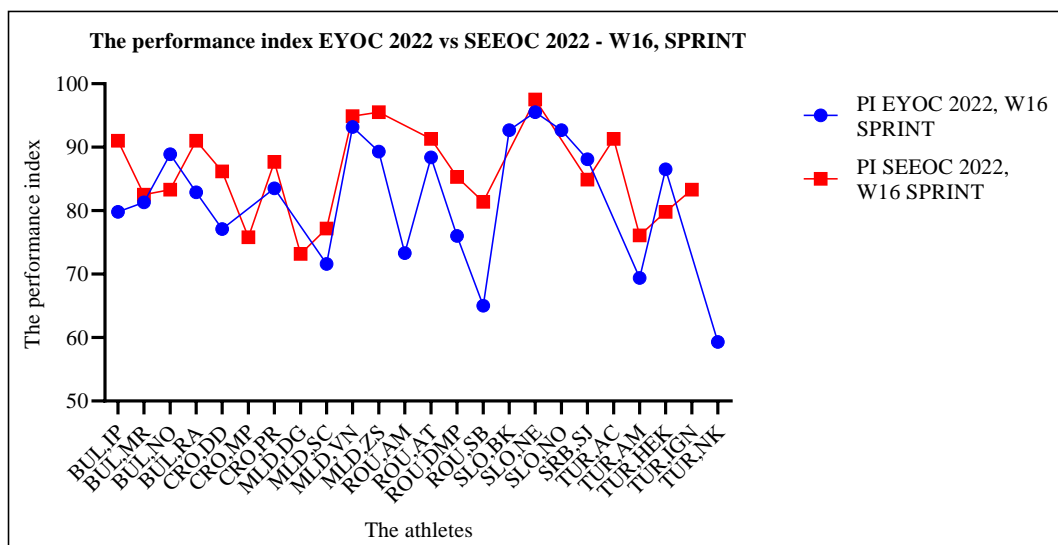


Figure 1. The performance index EYOC 2022 VS SEEOC 2022- W16, Sprint

From figure 1, which shows the performance index at EYOC 2022 versus SEEOC 2022 for the W16 category in the Sprint event, it can be observed that out of the total of 16 athletes, 81.25% had better performances in the SEEOC competition compared to EYOC, while only 18.75% of the athletes had a higher performance index at EYOC compared to SEEOC. Nine athletes competed in only one competition.

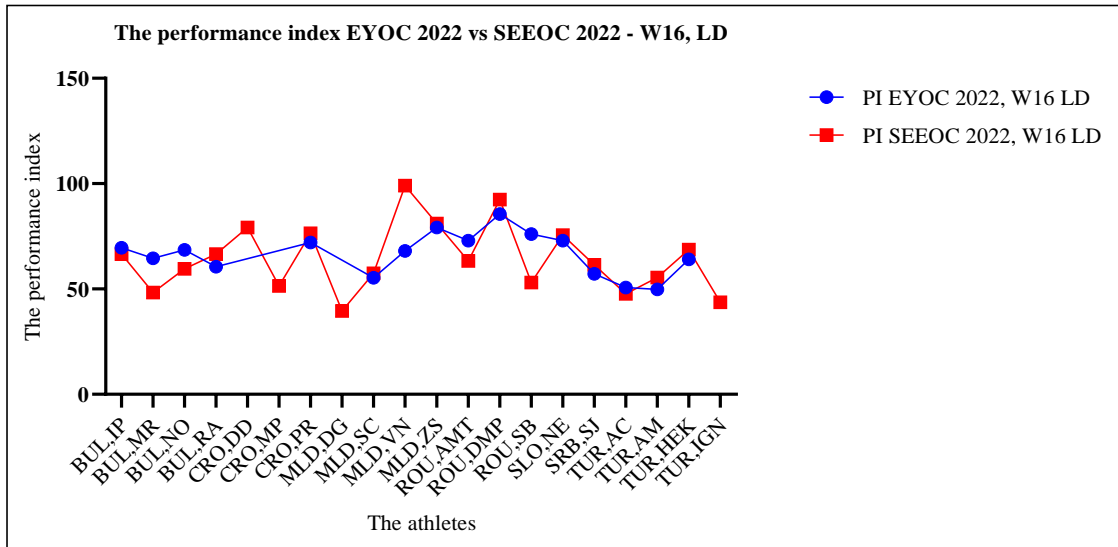


Figure 2. The performance index EYOC 2022 VS SEEOC 2022 - W16, Long-Distance

From figure 2, which displays the performance index at EYOC 2022 versus SEEOC 2022 for the W16 class in the long-distance event, it can be observed that out of the total of 15 athletes, 60% had a better performance as an improvement in the SEEOC competition compared to EYOC, while 40% of the athletes had a higher performance index at EYOC compared to SEEOC.

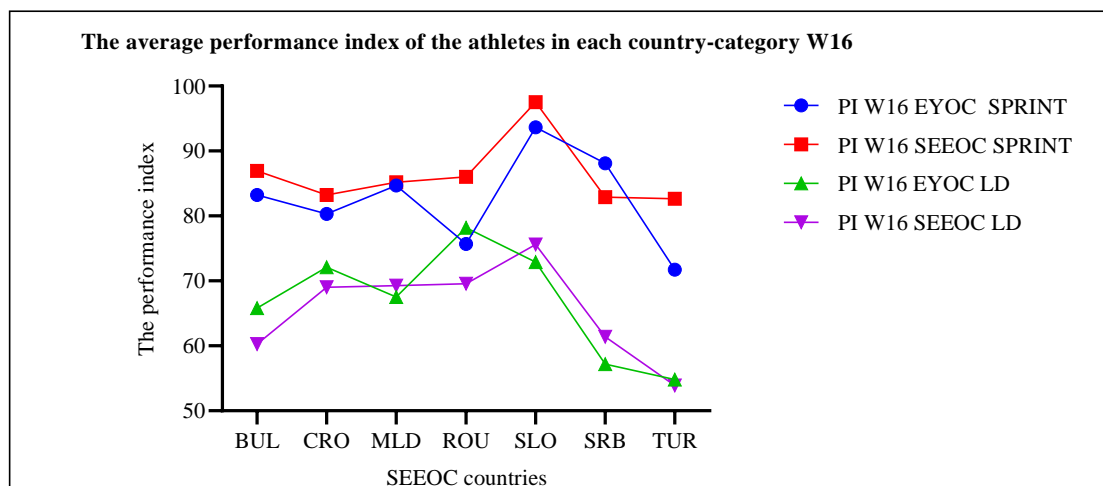


Figure 3. The average performance index of the athletes in each country - W16 Class

From the chart on the average performance index of the athletes in each country - W16 Class (figure 3), it can be observed that in the SEEEOC sprint events, the average performance index for each country (represented by the red squares) is higher (as shown on the Y axis) compared to the EYOC sprint events, except for Serbia. In the long-distance events, three countries performed better at EYOC compared to SEEEOC. This observation is consistent with the M16 Class, where the

average performance index values (with the exception of Romania in the EYOC sprint event) were higher for the sprint events compared to the long distance events. This suggests that there may have been some uncertainty in navigating through the forest and mistakes made by athletes, resulting in lower performance index values ranging from 54.83% to 78.20% at EYOC, and from 53.88% to 75.6% at SEEEOC.

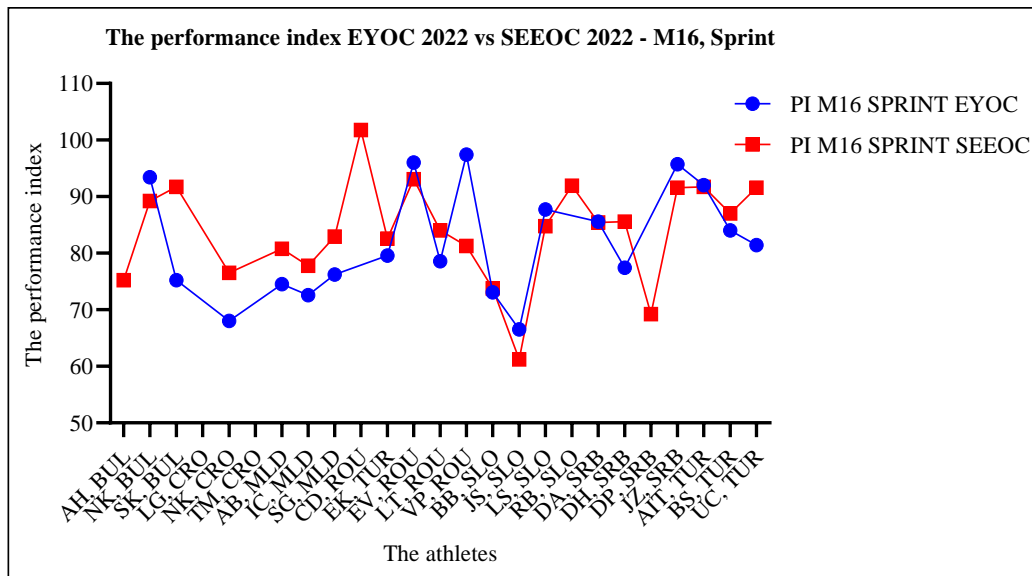


Figure 4. The performance index EYOC 2022 VS SEEEOC 2022 - M16, Sprint

Table 1. Correlation between the PI M16 for LD at EYOC and the Sprint at EYOC, Sprint SEEEOC, LD SEEEOC

Correlation Tabular results	A	B	C	D
	PI M16 SPRINT EYOC	PI M16 SPRINT EYOC vs. PI M16 SPRINT SEEEOC	PI M16 SPRINT EYOC vs. PI M16 LD EYOC	PI M16 SPRINT EYOC vs. PI M16 LD SEEEOC
1 Pearson r				
2 r		0.6767	0.1045	0.5231
3 95% confidence interval		0.3212 to 0.8650	-0.3960 to 0.5572	0.07439 to 0.7957
4 R squared		0.4579	0.01093	0.2736
5				
6 P value				
7 P (two-tailed)		0.0015	0.6897	0.0259
8 P value summary		**	ns	*
9 Significant? (alpha = 0.05)		Yes	No	Yes
10				
11 Number of XY Pairs		19	17	18

Table 1 shows the correlation coefficients and p-values between different Performance Indices (PIs) for the Male 16 (M16) athletes at EYOC. The Pearson r column displays the correlation coefficient for each pair of PIs, and the 95% confidence interval displays the range within which the true correlation coefficient is estimated to register with 95% confidence. The R squared column displays the proportion of the variance in one PI that can be explained by the variance in the other PI. The P value column displays the p-value for each correlation coefficient, denoting the probability of obtaining a correlation as strong as the observed one by chance, assuming that the two variables are

actually uncorrelated. The P value summary column indicates whether each correlation is statistically significant at the 0.05 alpha level, with "ns" indicating non-significance.

For Male 16 athletes at EYOC, there is a moderate positive correlation between the PI for the Sprint discipline at EYOC and SEEOC ($r = 0.6767$, $p = 0.0015$), indicating that athletes who performed well in the Sprint discipline at EYOC also tended to perform well in the sprint discipline at SEEOC. The correlation is statistically significant at the 0.05 alpha level, as indicated by the P value summary (**).

There is no significant correlation between the PI for the sprint discipline at EYOC and the long-distance discipline at EYOC ($r = 0.1045$, $p = 0.6897$) or the PI for the sprint discipline at EYOC and the long-distance discipline at SEEOC ($r = 0.5231$, $p = 0.0259$), indicating that performance in the sprint discipline does not necessarily predict performance in the long-distance discipline, and vice versa.

Similarly, there is no significant correlation between the PI for the long-distance discipline at EYOC and the Sprint discipline at EYOC ($r = 0.1045$, $p = 0.6897$) or the PI for the long-distance discipline at EYOC and the Sprint discipline at SEEOC ($r = 0.08109$, $p = 0.7268$), as well as between the PI for the long-distance discipline at EYOC and the long-distance discipline at SEEOC ($r = 0.01063$, $p = 0.9635$), indicating that performance in the long-distance discipline does not necessarily predict performance in the sprint discipline, and vice versa, and also that performance in the long-distance discipline at EYOC does not necessarily predict performance in the long-distance discipline at SEEOC.

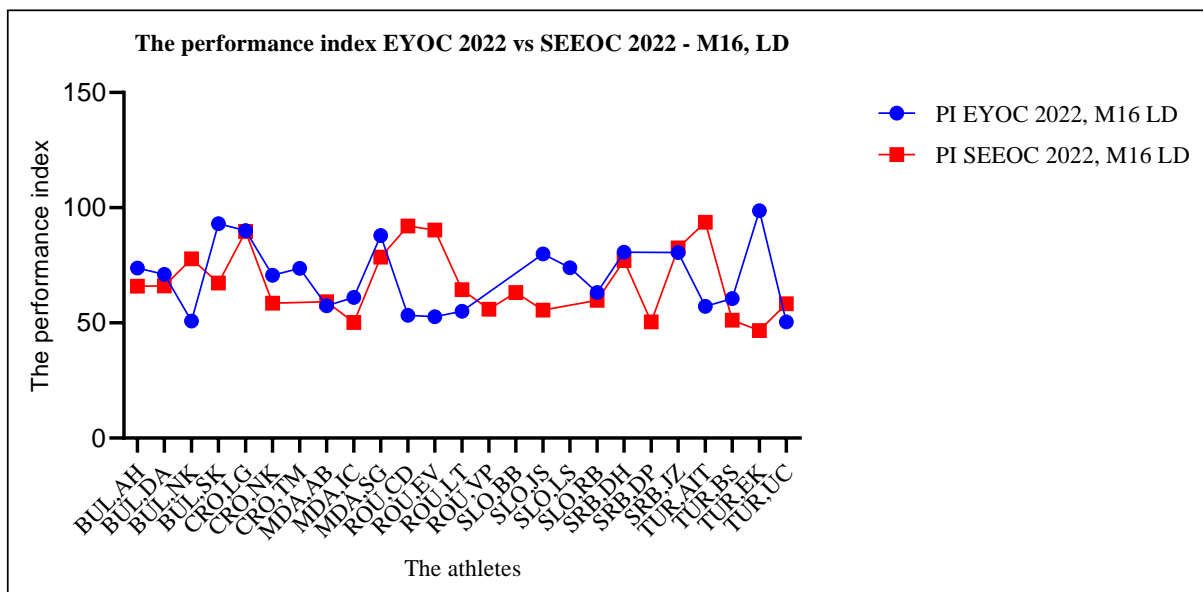


Figure 5. The performance index EYOC 2022 VS SEEOC 2022 - M16, long-distance

In the long-distance event (figure 5), out of a total of 22 athletes, 13 of them had a higher performance index at EYOC compared to SEEOC, representing 59.1% of the athletes who competed in both competitions. On the other hand, 9 athletes had a better performance improvement at SEEOC compared to EYOC, representing 40.9% of the athletes who competed in both competitions. It is worth noting that only 3 athletes competed in a single event.

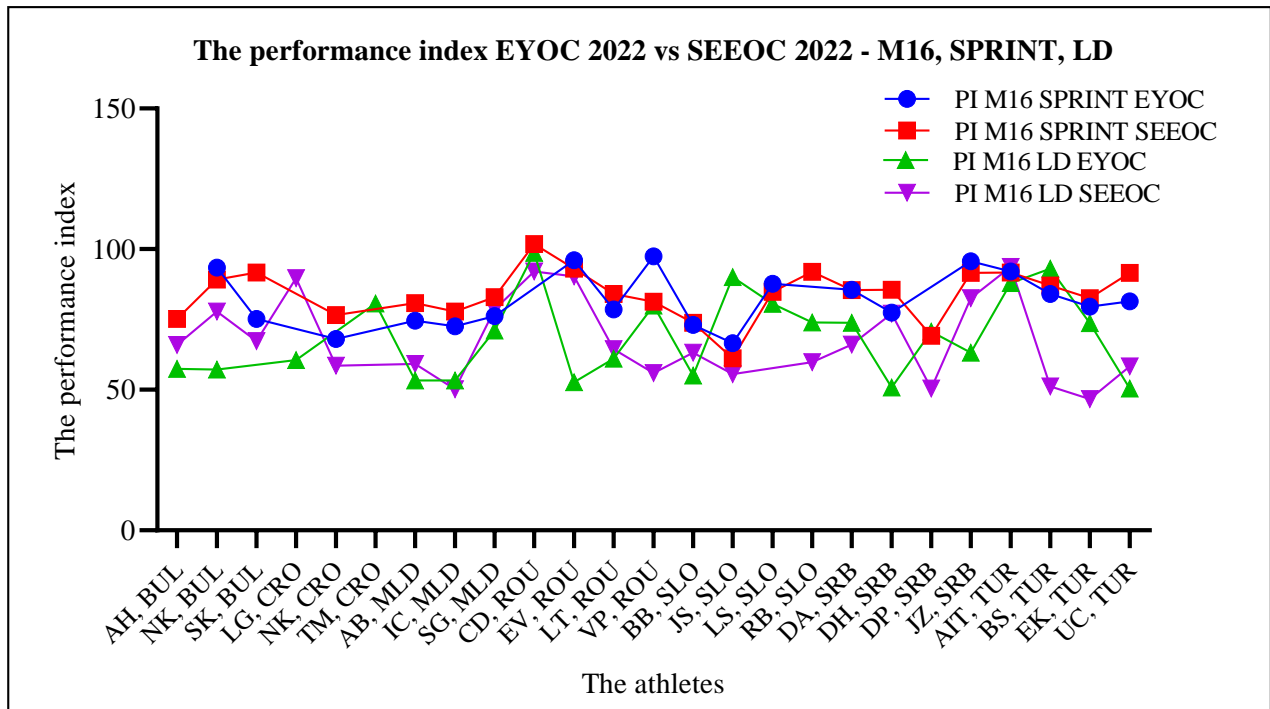


Figure 6. The performance index EYOC 2022 VS SEEOC 2022- M16, sprint and long-distance

The data shows that 91.3% of the athletes (figure 6) had a higher performance index in the sprint event compared to the long-distance event, indicating that most of the athletes were better suited for the running tempo of the sprint competition rather than the technical demands of the long-distance competition.

The long distance competition appears to pose greater technical challenges and difficulties in terms of navigation and control, resulting in a lower performance index for the athletes. This finding may indicate a need for targeted training and preparation to improve the technical skills of the athletes in the long-distance event.

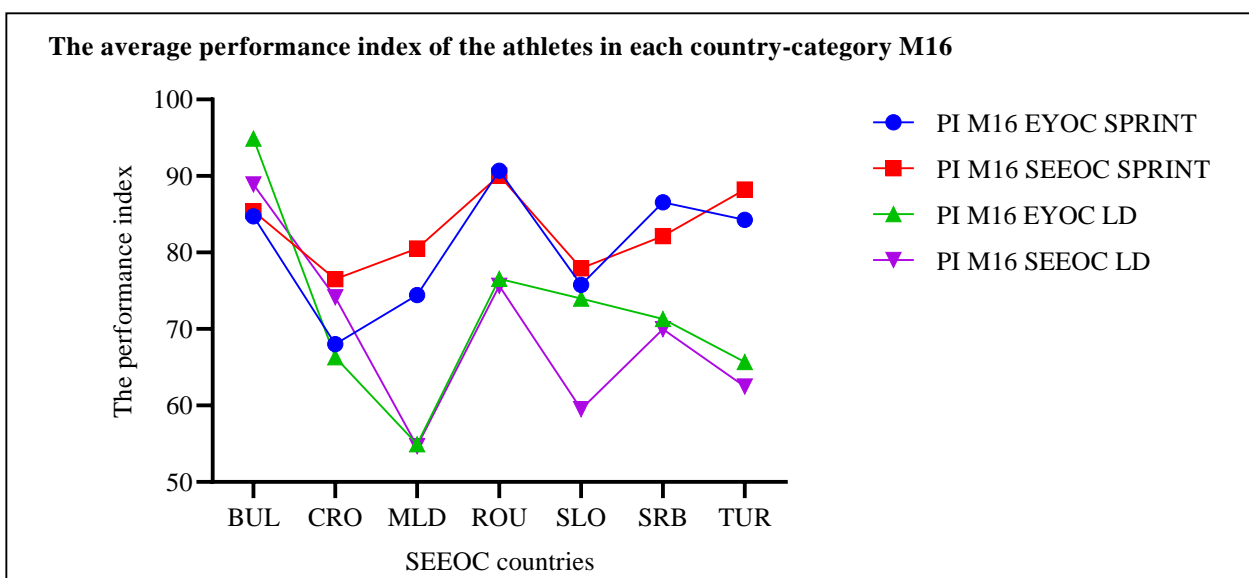


Figure 7. The average performance index of the athletes in each country - M16 Class

The data in the chart (figure 7) suggest that, in general, athletes from most of the countries performed better in the sprint events compared to the long-distance events. This could be due to a variety of reasons, such as the complexity of the navigation challenges, differences in the terrain, or weather conditions. It is also possible that the athletes' training and preparation were geared more towards the sprint events. Furthermore, only one country (Romania) had a higher average performance index at M16 in EYOC compared to SEEOC, indicating that the athletes were well-prepared and may have benefited from the additional 8 weeks of training and preparation between the two competitions.

Based on the data provided, we can conclude that, with the exception of Croatia, all the other countries had lower or almost equal average performance index values at SEEOC compared to EYOC in the long distance tests. This suggests that the long distance competition field at SEEOC may have been more challenging, requiring additional navigation skills, which resulted in lower performance index values for the athletes. The range of performance index values at SEEOC in the long-distance test (54.7% to 88.88%) suggests that the athletes may have had hesitations in choosing the correct options or in reaching the checkpoints, which may have resulted in additional time spent on the course and, consequently, affected their overall performance.

Overall, these results highlight the importance of adequate preparation and training for athletes, particularly in the areas of navigation and decision-making. Future analysis and investigation are necessary to identify the factors that contributed to the differences in performance and to develop strategies to improve athletes' performance in future competitions.

Conclusion

If the first competition is held abroad and the second competition is held in the athlete's country of origin, it is possible for the athlete's performance to vary. Competing in familiar territory can provide a psychological advantage and boost confidence, leading to

improved performance. On the other hand, competing abroad can present new challenges and provide valuable experience, which can also positively impact performance in future competitions. The specific impact of competing in the home country versus abroad can vary greatly depending individually by athlete and the circumstances of each competition.

It is difficult to predict an athlete's performance in a subsequent competition based solely on the performance index in a previous competition. While past performance can provide insight into an athlete's capabilities, there are many other factors that can influence their performance in a subsequent competition, such as changes in physical and mental preparation, training, competition experience, and the specific challenges of the new competition. In addition, the performance of other athletes in competition and the conditions specific to the day of the competition may also play a role in determining the outcome. It is important to consider all of these factors in order to accurately predict an athlete's performance in an upcoming competition. Our study suggests that for junior athletes to perform at their best, they need to focus on several key areas of training.

Firstly, junior athletes need to develop strategies that help them avoid orientation errors. This can be achieved through careful map-reading and planning routes that take into account the terrain and the location of checkpoints. Athletes should also practice techniques for relocating themselves quickly in case they become disoriented during the competition.

Secondly, technical training in areas that familiarize athletes with the competition field is crucial for success. This can include practicing on similar terrains, or in similar vegetation as the competition field. This will help athletes become more comfortable with the type of environment they will be competing in and develop a better understanding of the various terrain features that they will encounter.

Lastly, improving the speed of movement between checkpoints is also important.

Athletes should practice running on different types of terrain, such as hills and rough ground, to improve their physical fitness and agility. They should also develop techniques for efficient navigation and route planning, which will help them move quickly and efficiently between checkpoints.

Authors' Contribution

All authors have equally contributed to this study.

References:

- Batista, M.M., Paludo, A.C., da Silva, M.P., Martins, M.V., Pauli, P.H., Dal'Maz, G., Stefanello, J.M., Tartaruga, M.P. (2021). Effect of mental fatigue on performance, perceptual and physiological responses in orienteering athletes. *Journal of Sports Medicine and Physical Fitness*, 61 (5), 673-679. <https://doi.org/10.23736/S0022-4707.21.11334-9>
- Gasser, B.A., Hoppeler, H.H. (2019). Performance analysis in orienteering with consideration of both cognitive and physical aspects. <https://doi.org/10.34045/SSEM/2015/20>
- Bergström, M., Mats, J., and Stig, A.S. (2021). Orienteering from Cradle to Grave—How a Sport Could Offer Lifelong Participation. *Social Sciences* 10: 146. <https://doi.org/10.3390/socsci10050146>
- Bird, S., Balmer, J., Olds, T., Davison, R.C. (2001). Differences between the sexes and age-related changes in orienteering speed. *J Sports Sci*; 19:243-52, <http://dx.doi.org/10.1080/026404101750158295>
- Creagh, U., Reilly, T. (1997). Physiological and biomechanical aspects of orienteering. *Sports Med*; 24:409-18, <http://dx.doi.org/10.2165/00007256-199724060-00005>
- Eccles, D.W., Aarsal, G. (2015). How do they make it look so easy? The expert orienteer's cognitive advantage. *J Sports Sci*; 33:609-615, <https://doi.org/10.1080/02640414.2014.951953>
- Eccles, D.W., Aarsal, G. (2014) How do they make it look so easy? The expert orienteer's cognitive advantage. *J Sports Sci*; 26:1-7, <http://dx.doi.org/10.1080/02640414.2014.951953>
- Galory, Y., Tenenbaum, G., Shimrony, S. (1986). Cognitive behavioural strategies and anxiety in elite orienteers. *J Sports Sci*; 4:39-48, <http://dx.doi.org/10.1080/02640418608732097>
- Guzman, J.F., Pablos, A.M., Pablos, C. (2008). Perceptual-cognitive skills and performance in orienteering. *Percept Mot Skills*; 107:159-64, <http://dx.doi.org/10.2466/pms.107.1.159-164>
- Hebert-Losier, K., Mourot, L., Holmberg, H.C. (2015). Elite and amateur orienteers' running biomechanics on three surfaces at three speeds. *Med Sci Sports Exerc*; 47: 381-389, <http://dx.doi.org/10.1249/MSS.0000000000000413>
- Hebert-Losier, K., Platt, S., Hopkins W.G. (2015). Sources of Variability in Performance Times at the World Orienteering Championships. *Med Sci Sports Exerc*; 47: 1523-1530 <http://dx.doi.org/10.1249/MSS.0000000000000558>
- Tartaruga, M.P. (2021). effect of mental fatigue on performance, perceptual and physiological responses in orienteering athletes. *Journal of Sports Medicine and Physical Fitness*, 61 (5), 673-679. <https://doi.org/10.23736/S0022-4707.21.11334-9>

By focusing on these key areas of training, junior athletes can improve their performance and avoid fluctuations in their results. This will help them to compete more effectively at the national and international levels, and achieve their goals in the sport of orienteering.