# ANALYSIS OF THE PERFORMANCE INDICES IN URBAN SPRINT ORIENTEERING IN RELATION TO THE PERFORMANCE IN TRACK RUNNING

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**Abstract:** The purpose of this study is to analyze to what extent performance in track events leads to similar performances in the urban sprint orienteering events for male and female athletes, members of the Romanian national Orienteering team.

In order to test this assumption, we analyzed performance indices obtained in the track running races and in stages of the National Urban Sprint Championship. The good results in urban sprint competitions involve quick route choice decisions and executing them without mistakes, at a running tempo with maximum oxygen consumption. Average winning times in the urban sprint races is in most competitions between 12-15 minutes. The orienteering tasks are reduced in urban sprint events, but the concentration must be at maximum during the entire race. The differences between the performance indices in the track events and orienteering competitions are generated mostly by route choice and not noticing impassable obstacles, which leads to detours.

Following the analysis, it was proven that for both male and female groups of athletes sampled, there was only one stage with the significant statistical link between performances obtained in track trials and in competitions at a statistical threshold value of 1%. However, a direct statistical link was confirmed at high intensity with a statistical threshold value between 0.001 - 0.008 between performances obtained in different championship stages. Excluding the influence of the cognitive factor, we observe the direct link indicating the increased performance in Orieteering events if performance in the running trials increases.

**Keywords:** *Orienteering, National Championship, running performance, Orienteering Performance*

## Introduction

Orienteering is a sport in full expansion with many world class athletes who are also being noticed in athletics competitions. It is assumed that if an orienteer is a faster athlete, he will deliver better results in orienteering events. The 5000 m track running trial as a performance predictor in the sprint event is mentioned by Gasser [1].

The magnitude of the performance in orienteering events depends on the athlete's ability to navigate the route in a time as short as possible by using his physical and technical capacities within the limits of his mental lucidity. In accordance with those mentioned above, in December 2018, Eric Saintrond, the general secretary of the International University Sports Federation stressed: "Orienteering is totally in line with the image of University Sports whose motto is:" Excellence in mind and body ". In elite orienteering a professionalism has developed in the last decades resulting in several world class elite runners and considerable number of juniors [2].

For the Classic Orienteering events [3] assumes that world class orienteers or more general orienteers get best results if running as constant as possible probably slightly below anaerobic threshold. High aerobic power in orienteers (up to 63 and 76 mVkg/min in women and men, respectively) is coupled with lower anaerobic performance [4]. In Urban Sprint competitions, only high running speed gives the athlete the opportunity to achieve success. For good results, one must combine physical performance conditioned by heart rate (HRmax)[5], oxygen intake (VO2max), pulmonary ventilation (VEmax), running speed (Vmax), and blood lactate concentration (LAmax) – [5] and changing the running tempo between controls based on cognitive aspects [6], [7], [8]). Successful performance requires considerable visual attention to critical cues from the map, the environment, and the travel [9].

The effortless reading of maps at 1:4000 or 1:5000 scales, requires that the running pace be pushed to the upper limit of the athlete, corresponding to the physical output in a 3-5 km running race. Shortest routes choices are not always the fastest. The greatest share in route choice is picking routes that involve minimum decision making. A great percentage of lost time is due to not noticing impassable obstacles, which leads athletes to use unplanned detours.

## Methods and Data sources

The authors have analyzed 106 races run by 13 male athletes aged between 18-36 with an average age of 25.2 years and 15 female athletes aged between 17-46 with an average age of 22 years in 5 and respectively 6 stages of the urban Sprint Orienteering Chanmpionship between Apr-Sep 2019. After a 9 year period when national team running trials were held off road, the trials returned to the track, the main goal being achieving good results at international Sprint events by adjusting

the training routine of the best athletes in relation to their evolution in competitions and trials. This study was done one year before the first World Orienteering Chanpionship that will include only sprint events and for the first time ever the Knock-Out Sprint with the estimated winning time for each elimination course is 6-8 minutes[10].

In the specialized orienteering literature, we find many studies that analyze the performance of athletes according to heart rate (HRmax), oxygen intake (VO2max), pulmonary ventilation (VEmax), running speed (Vmax), and blood lactate concentration (LAmax)[5]. Statistical analysis was done using Winsplits Pro and Graph Pad Prism 8.0. The study is based on the athletes' results processed using the performance index. 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.

**Data Analysis**

All descriptive statistical elements have been calculated for both, female and male athletes in orienteering, and analyzed based on the split times and the results obtained in both, running trials and championship stages.

**Results**

The correlation index between running trials, and championship stages, for female athletes(table 1).

There is a significant statistical connection, direct and of high intensity, between the performance results in the control trial, and the results obtained in stage 2 of the competition, with a significance threshold of 5%. There is also a direct connection, of average intensity, between performance results in the control group and stage 4 of the competition, with a significance threshold of 5%. Moreover, there were significant direct connections detected, of high intensity, between performance in stage 1 of the competition, compared with stages 3, 4, and 5.

The same connection has been confirmed between performance results in stage 3, compared with results in stage 5 of the competition. The direct connection: if performance results in the control trial are increasing, then performances in stage X of the competition will increase as well.

Table 1. The correlation index between running trials, and championship stages, for female athletes.

| | | 5000 m | St 1 | St 2 | St 3 | St 4 | St 5 | St 6 |
|---|---|---|---|---|---|---|---|---|
| 5000 m | Pearson Correlation | 1 | ,652 | **.848**** | **,318** | **.584*** | ,270 | -,042 |
| | Sig. (2-tailed) | | ,057 | ,008 | ,290 | ,046 | ,661 | ,882 |
| | N | 15 | 9 | 8 | 13 | 12 | 5 | 15 |
| St 1 | Pearson Correlation | | 1 | ,622 | **.847*** | **.838*** | **1.000**** | -,013 |
| | Sig. (2-tailed) | | | ,188 | ,016 | ,019 | | ,974 |
| | N | | 9 | 6 | 7 | 7 | 2 | 9 |
| St 2 | Pearson Correlation | | | 1 | ,539 | ,651 | ,744 | ,218 |
| | Sig. (2-tailed) | | | | ,212 | ,161 | ,256 | ,604 |
| | N | | | 8 | 7 | 6 | 4 | 8 |
| St 3 | Pearson Correlation | | | | 1 | .642* | **1.000**** | ,304 |
| | Sig. (2-tailed) | | | | | ,024 | ,000 | ,313 |
| | N | | | | 13 | 12 | 5 | 13 |
| St 4 | Pearson Correlation | | | | | 1 | ,860 | ,279 |
| | Sig. (2-tailed) | | | | | | ,140 | ,380 |
| | N | | | | | 12 | 4 | 12 |
| St 5 | Pearson Correlation | | | | | | 1 | ,016 |
| | Sig. (2-tailed) | | | | | | | ,980 |
| | N | | | | | | 5 | 5 |
| St 6 | Pearson Correlation | | | | | | | 1 |
| | Sig. (2-tailed) | | | | | | | |
| | N | | | | | | | 15 |

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

The correlation index between the running trials, and competition stages for male athletes(table 2).

There is a significant statistical connection between performance rersults in the control trial, and the results in stage 4 of the competition, at a significance threshold of 1% (the significance value below 0.01). There was no significant statistical relation detected between performance results in the control trial and the rest of the stages at the competition level, at a significance threshold of 5% ( all sig values in the first line of the table are over

the 0.05 mark). There were however significant direct connections detected, of high intensity, between performance results in stage 1 of the competition, compared with stage 2 and 3. Same connections were confirmed between results in stage 2, compared with stage 3, and stage 4 respectively. The direct connection: if performance results in the control event are increasing, then the results in stage X at the competition level will increase as well.

Table 2. The correlation index between the running trials, and competition stages for male athletes.

| | | 10000 m | St 1 | St 2 | St 3 | St 4 | St 5 |
|---|---|---|---|---|---|---|---|
| 5000 m | Pearson Correlation | 1 | ,099 | ,034 | -,073 | ,587 | -,081 |
| | Sig. (2-tailed) | | ,785 | ,917 | ,864 | ,126 | ,849 |
| | N | 13 | 10 | 12 | 8 | 8 | 8 |
| St 1 | Pearson Correlation | | 1 | **1.000**** | **.927**** | ,718 | ,509 |
| | Sig. (2-tailed) | | | ,000 | ,008 | ,108 | ,198 |
| | N | | 10 | 10 | 6 | 6 | 8 |
| St 2 | Pearson Correlation | | | 1 | **.966**** | **.799*** | ,507 |
| | Sig. (2-tailed) | | | | ,000 | ,031 | ,199 |
| | N | | | | 7 | 7 | 8 |
| St 3 | Pearson Correlation | | | | 1 | ,591 | ,698 |
| | Sig. (2-tailed) | | | | | ,217 | ,123 |
| | N | | | | 8 | 6 | 6 |
| St 4 | Pearson Correlation | | | | | 1 | -,098 |
| | Sig. (2-tailed) | | | | | | ,875 |
| | N | | | | | 8 | 5 |
| St 5 | Pearson Correlation | | | | | | 1 |
| | Sig. (2-tailed) | | | | | | |
| | N | | | | | | 8 |

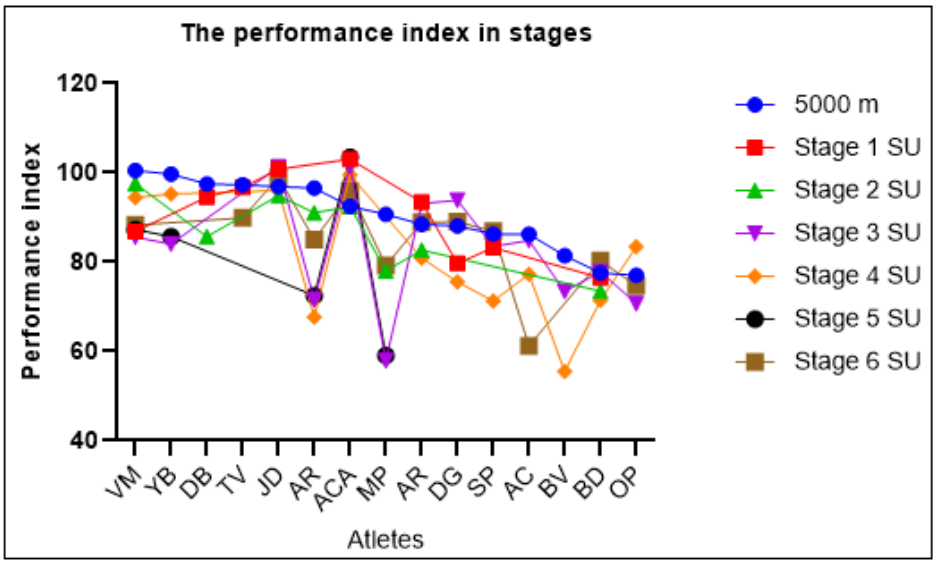
**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

We also found that there was no significant difference in terms of women and men.

It is observed from the analysis of the graph(figure 1) that the best female athletes ranked based on the performance indexes in the running trials, have inferior performance indexes when compared with same rank female athletes at the competition level. A single competitor has performance indices above the ones obtained in running trials but also above all other competitors. This female athlete is the runner up European junior champion, and the results of our study confirm her value.

Figure 1. Comparison of the performance indices between running trials and urban sprint stages for the female athletes.




When studying male athletes performance in running trials versus competitions, it can be observed that the fastest athletes have fluctuating levels of progress in the competition stages due to route choice errors(figure 2). We assume that these errors are due to the time constraint (caused by the rapid running pace) and the insuficient number of training sessions specific to the urban sprint. With the imposed running pace, these

athletes compensate lost time from technical errors and get better ranked places in most of the stages when compared with the other opponents who may not comit any erros, but run at a slower pace.
IZ: Two competitions with performance indices above those obtained in running trials (compared to opponents); Two competitions with performance indices below those obtained in running trials (compared to opponents).
DB: Four competitions with performance indices above those obtained in running trials (compared to opponents); One competition with performance indices below those obtained in running trials (compared to opponents).
EGM:Three competitions with performance indices below those obtained in running trials (compared to opponents).
Figure 2.Time behind leader.

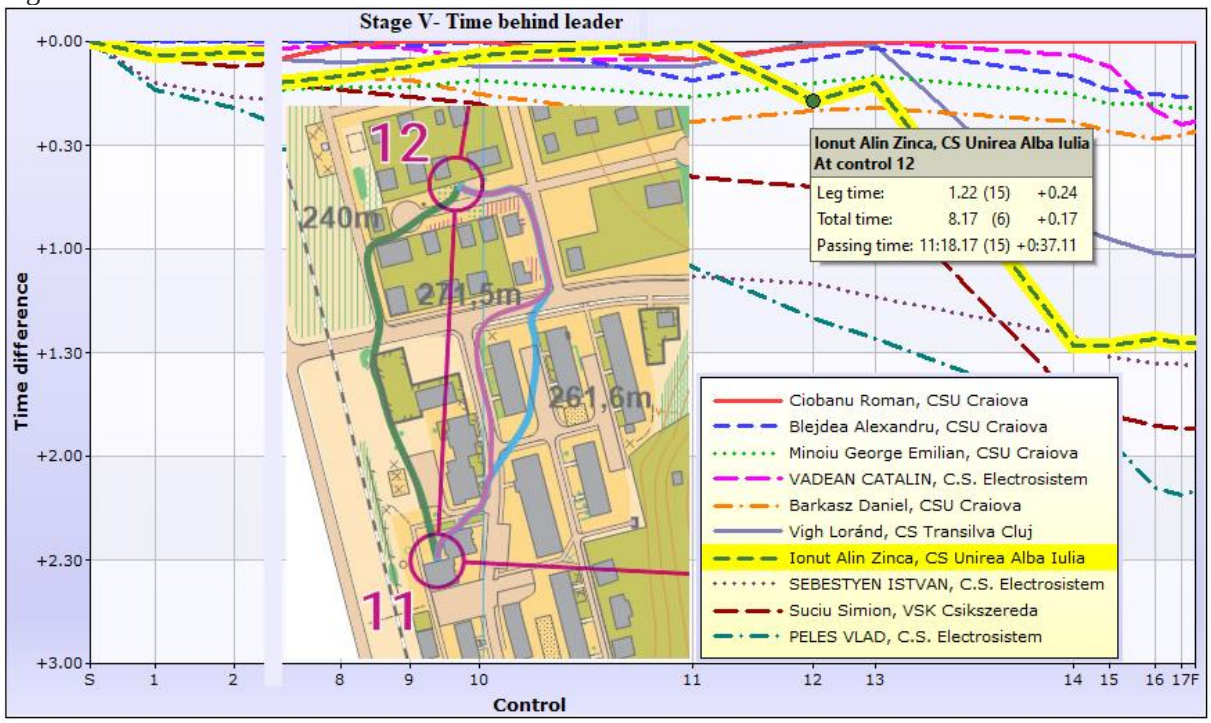
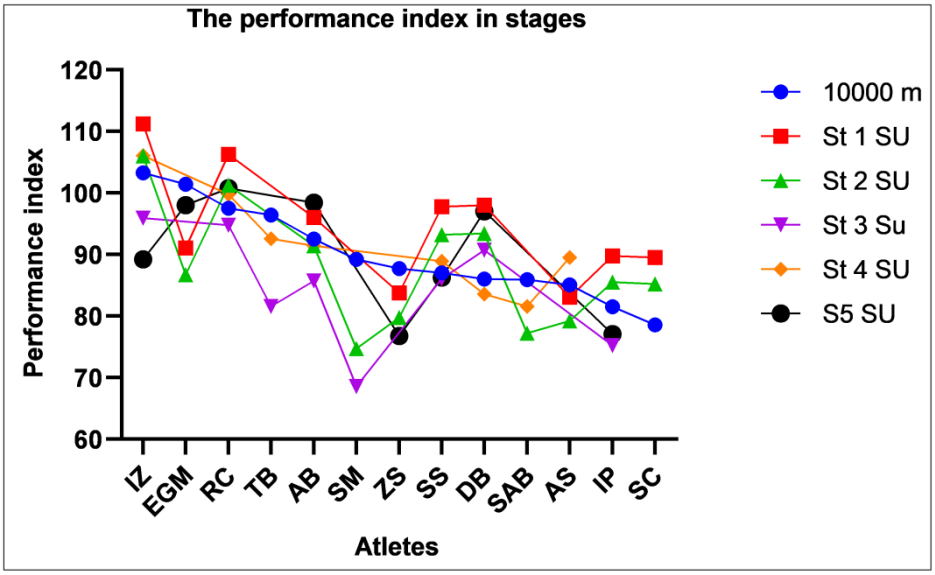



Figure 3. Comparison of the performance indices between running trials and urban sprint stages for the male athletes.




Captured variance is not possible to clearly attribute to either cognitively or biologically factors. Undoubted orienteering actions entails both cognitive and biological restrictions whereby these components underlay several affecting mechanism [7]

## Conclusion

The study generates an overview of the evolution of the high performance athletes, members of the National Team, in the Urban sprint competitions, which clearly illustrates the connection between the performance in running races and the performance in orienteering Sprint events. The analysis of this evolution points the athlete to which areas should be addressed to improve results. Athletes who obtain performance indices in orienteering events above those obtained in running trials must focus more on improving physical fitness. Athletes who obtain performance indices in orienteering events below those obtained in running trials must focus more on route choice selection, better concentration during the race and improving the level of preparation specific to the Sprint event. In order to obtain world class results it is a must to have runing trials performance clsoe to the best athletes in the world and to consider the statement made by Sir Steve Redgrave[11]: "Athletes train their body to incredible levels, everything is put into the physical training, yet very little is done mentally. Most of the time the limiting factor is the mind and not the body''.

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