

DETERMINATION OF TAXONOMIC TYPE STRUCTURES OF TOP DECATHLON ATHLETS

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Abstract

Discovering the best decathlete profile in relation to the level of world-class performance enable the assessment of matching the most promising structures for achieving the maximum potential in the decathlon. Featured typical taxonomic structure indicated that the area decathlon characterized by a very wide range of disciplines structure the relationship between the presences of versatile types of highly talented decathlon. Not noticed coincidence of result achievements in relation to the branches of disciplines as well as expressed greater coincidence according manifestations motor dimensions that are synergistically manifested in certain disciplines. Key highlights the success of a results make technical efficiency (pole vault) and efficiency of expressing energy capacity or aerobic-anaerobic component (running 1500m). However, no apparent domination of sprint quality is not possible to achieve a significant breakthrough 'score achievements at the level of decathlon recorder.

Key words: *decathlon, taxonomic structures, profiles of versatility, the result efficiency*

Introduction

There has quality interrelation of motor quality in the composite athletic discipline decathlon is the foundation to the maximum the possibilities of expressing višebojskog potential. In applied terms, identifying relevant classification decathlete based on kinship interrelationship between disciplines get more precise information about the presence and effects of various typical višebojških structure in relation to the level of performance, which facilitates the selection procedure for the individual development strategies and optimize the training process. Results from the most comprehensive study of this aspect of the decathlon (Stemmler and Baumler, 2005), showed that in reality present a very broad typological furniture. However, it was found that the highest levels of performance desetobojci significantly different from the lower-level, Featuring versatility to a greater or lesser extent. This survey tries to uncover the extent to which the characteristics visokotalentiranih versatile decathlon differ, and sought to gain insight into the presence of characteristic types of functional dependence desetobojških disciplines that achieved the top of the world desetobojških achievements. At the same time we have tried to answer the essential question inherent višebojškim disciplines on meeting the preconditions for uniform expression of motor signals, or whether the result efficiency in the decathlon conditioned uniform structure of discipline and how it is actually possible? The study of conditions essential for the full expression and development višebojskog potential, Smajlovic (2000) is based on a comparative analysis of kinship structures višebojških discipline pentathlon, heptathlon and decathlon found that with increasing number of disciplines of heptathlon pentathlon to not generate significant changes in the structure of the relationship between disciplines but only by switching the decathlon in which significant but

inadequately expanded space for the manifestation of the general and athletic višebojške versatility. To obtain an objective notions of structure and typology desetobojškog space, an assessment of the measures and community manifestation of decathlon potential in relation to the level of 'score to achieve the most successful decathlon world.

Methods

The research included two groups, 350 decathlon senior category in the release 2010/2011. year and 100 the most successful decathlon world all the time (All time list 2011), taken from the official statistical yearbook of the International Association of Athletics Federations (IAAF). The matrix of squared Euclidean distances between the groups of subjects in the space of factor scores on scoring variables desetobojških discipline subjected to hierarchical cluster analysis method most distant neighbor. Cosine angle of two vectors was used as a measure of similarity or association. The grouping was based on the height of canonical correlation significant discriminant functions and precision posteriori classification, and as the most optimal solution found in the isolation of four clusters.

Results

Results of canonical discriminative analysis in both groups decathlon indicated the presence of significant differences between the proposed clusters and on that basis, the existence of three statistically significant discriminatory function of the highest significant levels, although the distinctive power of the first significantly higher (Table 1). According to the values of canonical correlation, with all the functions quite well expressed, but leave room for the conclusion that the resulting differences in the interconnection disciplines largely

influenced by other factors not covered exclusively manifested motor potential (different scoring system, specific circumstances during the competition, psychological predisposition, etc.).

Table 1. Testing of discriminative functions significance

	Fcn	Eigen	% Eig	CR	λ	χ^2	df	Sig.
All time list – 2011.	1	2,77	53,3	,86	,05	179,17	30	,000
	2	1,58	30,3	,78	,21	96,88	18	,000
	3	,85	16,4	,68	,54	38,23	8	,000
Senior list 2010./2011.	1	1,27	56,2	,75	,20	554,11	30	,000
	2	,55	24,3	,60	,45	274,14	18	,000
	3	,44	19,5	,55	,69	124,78	8	,000

(Fcn-diskr. function, Eigen - variance of diskr. function, CR-canonical correlation, Wilks' Lambda - significance of differences between group centroids, χ^2 -hi-square, Sig.- significance level.)

Table 2. Position of group centroids on functions (All time list 2011)

Cluster	F1	F2	F3
1	0,91	1,69	0,45
2	-0,71	-1,15	1,00
3	-2,06	0,28	-1,08
4	2,64	-1,21	-0,98

Table 3. Position of group centroids on functions (Senior list 2010./2011)

Cluster	F1	F2	F3
1	1,49	-0,12	0,39
2	-0,20	1,30	-0,52
3	-1,50	-0,09	0,85
4	-0,38	-0,84	-0,82

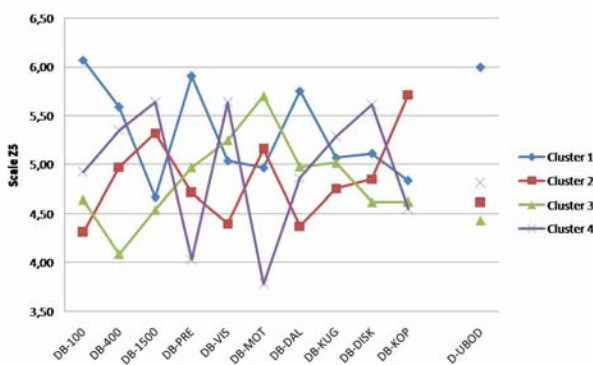


Figure 1. Group differences of Z5 values in 4 clusters (All time list 2011)

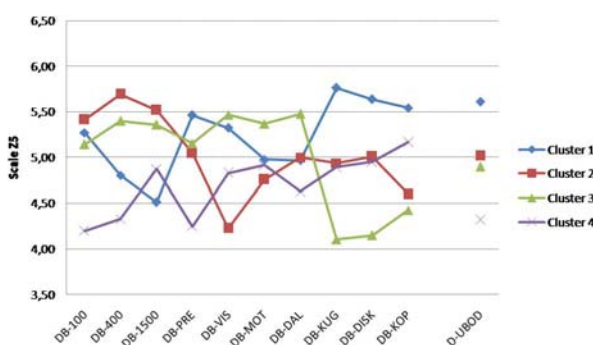


Figure 2. Group differences of Z5 values in 4 clusters (Seniors)

Table 4. Structure of diskriminative functions (All time list 2011)

Variable	1	2	3
DB-MOT	-,45	,19	,10
DB-DISK	,21	-,03	-,04
DB-100	,31	,70	,06
DB-PRE	-,06	,64	,32
DB-DAL	,12	,47	-,09
DB-1500	,15	-,32	,09
DB-KOP	-,09	-,19	,51
DB-VIS	,13	,08	-,47
DB-400	,35	,13	,37
DB-KUG	,07	,04	-,15

The specifics of the differences between separate clusters visible from Tables 2 and 3, which indicate the position of the centroid arithmetic mean factor scores in the area of discrimination function, and in Tables 4 and 5 which are visible individual contributions manifest variables distinguishing group centroid.

Table 5. Structure of diskriminative functions (Senior list 2010/2011)

Varijable	1	2	3
DB-KUG	,67	-,01	-,14
DB-DISK	,56	,01	-,20
DB-KOP	,40	-,32	-,08
DB-400	-,18	,71	,31
DB-100	,13	,56	,47
DB-1500	-,31	,36	-,06
DB-VIS	,04	-,41	,64
DB-PRE	,22	,32	,61
DB-DAL	-,12	,14	,39
DB-MOT	-,09	-,10	,26

Discussion and conclusion

By discovering the best profile decathlon different level 'score achievements, enabled the estimation of coincidences most promising structures for achieving the maximum potential in the decathlon. According to the results of the most successful groups of all time decathlon (All time list 2011) found that by far the highest level of performance achieved a results profile structure with a dominating sprint-jumping qualities with a slightly marked aerobic-anaerobic component, or speed-endurance when running stocks from 1500.

However, high results were achieved and expressed a heterogeneous structure with prevailing jumper-throwing qualities with aerobic-anaerobic component is the ultimate determinant of the result efficiency. The lowest level of success achieved type launchers and durable runners with the characteristics of technical efficiency (Figure 1). In the group of the most successful decathlon senior season in 2010 and 2011, also found exactly profiling one type of structure functional connections discipline that ensures a high level of success of his score and is characterized by a dominant sprint-throwing qualities.

The peculiarity of endurance and at the highest quality type groups is reflected in a weaker expression of aerobic-anaerobic component in the 400m and 1500m disciplines (Figure 2.). All other sections separated structures have a pronounced dominance of aerobic-anaerobic components with a weaker combination of sprint-throwing or sprint-jumping quality. In so doing, the lowest level of success achieved with the type of pitching-dominated jumping quality. In comparison to the profile and level of success of the most successful decathlon all the time, it was observed that the absence of the special quality of the expression of the maximum potential of decathlons impossible to achieve the highest level of success. Joining the results of other authors in the analysis of typological sets decathlon (Etcheverry, 1995; Lee, 2001; Van Damme et al., 2002; Stemmler and Baumler, 2005), it can generally be divided into two distinct areas: the versatile types with 3 of the 4 factors (sprinting, jumping, throwing, and durability) with excellent performances and types of specialists with 1 or 2 factors with average and below-average performances. For versatile types dominate pentathlons jumper sprint and sprint-type jumper in relation to the types of sprinter-thrower and jumper-pitcher. A comparative analysis of the types and levels of success isolated structures in this work do not notice the coincidence rezultatskih achievements in relation to the structural similarity of decathlon disciplines nor expressed greater coincidence of events in accordance with the motor dimensions that are synergistically manifested in certain disciplines. This suggests that a very important role in the ultimate success of his score has a level of technical efficiency which enables a more complete expression of the natural resources in technically complex disciplines. In relation to the branch disciplines, general characteristics of selected effective structure regardless of the level of the total 'score achievement is more pronounced unevenness level of achievement in jumping, in relation to levels of achievement in the sprint and throwing disciplines. That fact is not surprising given that the jumping disciplines present the greatest differences in the manifestations of motor dimensions and the biggest requirements for technical efficiency, particularly in the pole vault. On the other hand, there is a significant opposition motor skills based on the severity of the stimulus in the short term and one-time capacity of determining the capacity of maximum physical potential (sprinting, jumping and throwing) of ability based more on the implementation of repetitive motor structure.

This highlights the second most important determinant of the success of his score in the decathlon and refers to the efficiency of energy capacity, or the expression of aerobic-anaerobic component in running events of 1500m and partly 400m. According to the profile quality typical group, isolated in a group of the most successful decathlon world of all time (Figure 1), it is obvious that the characteristics of the model structure for maximum expression decathlon potential decathlete based primarily on having very high levels of speed potential, and then of speed and explosive quality, with the effective implementation of complex technical disciplines. Results of this study suggest that the desired synergy effect of expressing the maximum potential musculoskeletal athlete in the decathlon can not be fully realized, and that the real present structures has a primary role in the ultimate pointing soon as the high level of efficiency was recorded at very dispersed level of achievement Discipline. These data do not support the decathlon as a representative decathlon discipline in modern sport. The question is: Why is the trend of favouring sprint and jumping disciplines among decathlons and thus lower the synergy effect of the relationship between motor quality? First of all, should be considered the primary conditionality relating to the individual structure of the relationship between motor predisposition that predisposes the development potential and then limiting the possibilities for the realization of methodological requirements specific međurazvoja motor quality in the training process.

However, it turned out that these quite legitimate factors to a much lesser extent, limited in comparison to the importance of conditionality results type and character of the functional interrelationships of disciplines represented in the decathlon and scoring system results. Specifically, it was found that in the current IAAF decathlon tables published in 2001, on points evaluation of the discipline decathlon of the type of parabolic dependence. In doing so, scoring growth disciplines of running is the most pronounced progression, progression in jumping is less pronounced, in the throwing disciplines is slight progression, close to the type of linear regression (Smajlović, 2000; Bilić 2013). The realization that the share of individual disciplines at various levels of sporting achievement is not the same, has a special significance for practice because on the basis of the tables produced structures proportional evaluation of result achievements, develops strategies and the dynamics of preparation and training decathlon.

References

- Bilić, M. (2013). *Tipološke strukture ispoljavanja rezultatske efikasnosti najuspješnijih desetbojaca svijeta* [Typological structures of results efficiency presenting of most successful world decathlons. In Croatian.]. /Doctoral dissertation/. Mostar: Nastavnički fakultet Univerziteta Džemal Bijedić.
- van Damme, R., Wilson, R.S., Van Hooydonck, B., & Aerts, P. (2002). Performance constraints in decathletes. *Nature* 415, 755-756.
- Etcheverry, S.G. (1995). Profile of the decathlete. *New Studies in Athletics*, 10(3), 51-55.

- Li, T. (2001). Chinese and foreign decathlon athletes performance characteristics of the comparative analysis of. *Journal of Sports Science*, 3, 47-49.
- Park, J., & Zatsiorsky, V.M. (2011). Multivariate Statistical Analysis of Decathlon Performance Results in Olympic Athletes (1988-2008). *World Academy of Science, Engineering and Technology*, 77, 1128-1131.
- Smajlović, N. (2000). Struktura atletske discipline višeboja u funkciji maksimalnog ispoljavanja višebojskog potencijala najuspješnijih sedmobojki svijeta [Structure of athletics heptathlon disciplines in function of maximal potential expression of best world heptathlons. In Bosnian.]. /Doctoral dissertation/. Sarajevo: FFK.
- Stemmler, M., & Baumler, G. (2005). The Detection of Types among Decathletes using Configural Frequency Analysis (CFA). *Psychology Science*, 47(3-4), 447-466.
- Wang, Z., & Lu, G. (2007). The Czech Phenomenon of Men's Decathlon development. *International Journal of Sports Science and Engineering*, 1(3), 209-214.
- * * * (2011). /International Association of Athletics Federations, 2010; 2011/. *Results, Top lists for combined events.* /on line/. www.iaaf.org From net 30.01.2012 i 10.09.2012.
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UTVRĐIVANJE TIPSKIH VIŠEBOJSKIH TAKSONOMSKIH STRUKTURA VRHUNSKIH DESETOBOJACA

Sažetak

Otkrivanje najkvalitetnijih profila desetobojaca u odnosu na ostvareni nivo uspješnosti svjetskog ranga omogućilo je procjenu podudarnosti najperspektivnijih struktura za ostvarenje maksimalnih potencijala u desetoboju. Izdvojene tipske taksonomske strukture ukazale su da je prostor desetoboja karakterističan po vrlo širokoj paleti struktura međuodnosa disciplina uz prisutnost svestranih tipova visoko talentiranih desetobojaca. Nije zamijećena podudarnost rezultatskih postignuća u odnosu na grane atletske discipline kao ni izraženo veća podudarnost sukladno manifestacijama motoričkih dimenzija koje se sinergijski ispoljavaju u pojedinim disciplinama. Ključne odrednice rezultatske uspješnosti čine tehnička efikasnost (skok s motkom) i efikasnost ispoljavanja energetske kapaciteta, odnosno aerobno-anaerobne komponente (trčanje 1500m). Međutim, bez izrazite dominacije sprinterskih kvaliteta nije moguće ostvariti značajniji proboj rezultatskog ostvarenja na nivou desetbojskog rekordera.

Ključne riječi: desetbojci, taksonomske strukture, profili svestranosti, rezultatska efikasnost

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