MODEL OF ANTHROPOLOGICAL CHARACTERISTICS RESPONSABLE FOR SUCCESS IN SWIMING IN YOUNG SWIMMERS

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Abstract

On the sample of 10 selected swimmers, members of national swimming team of Bosnia and Herzegovina, it was conducted the research with the aim of finding those anthropological characteristics that are responsible for success in swimming. The paper presented the results of analysis of the influence of some anthropological components, which directly influences the result of swimming. It is tested the hypothesis that the significant correlation between anthropological dimension set in latent form and the results of success in swimming is expected. Conducted a regression analysis, but in a way that the previously isolated factors as the latent dimension, brought in connection with a sports result in swimming. This was due to determine the maximum possible model from existing data. Sixteen of the latent dimensions or factors are included, of which: 3 morphological factors, 5 isokinetics factors, 2 functional factors, 2 factors analysing blood composition and 4 motor factors. All these factors together represent a set of anthropological characteristics of swimmers in a way that they are connected and integrated into the whole. Results of this study show that success in swimming can be considered functional abilities, especially the maximum consumption of oxygen – VO2max, and balanced systolic and diastolic pressure. Then, the optimal morphological structure, which seeks specific swimming model, and also highly developed but at the same time and very specific colored motor abilities model differentiated in a way that ensures optimal operation in extremely specific medium, such as water. Finally, indicators of blood and isokinetic indicators can be considered much less important for achieving results, but it is not excluded that they may be important in the training process of transformation in individual stages.

Key words: *models, anthropological characteristics, swimmers, relations, result*

Introduction and aim

In contemporary theory and practice to deal with diverse tasks successfully managing the process of sports training, widely used different means of measuring all the relevant skills and characteristics of athletes, including swimmers and, with the aim of finding those anthropological characteristics that most influence to achieve top results. However, measurements in the sport are one of the most complex problems, given the existence of many overlapping, mutually linked specific traits, abilities and characteristics of athletes, who usually cannot be directly measured without disturbing the integrity of the organism. This complexity has increased especially with the diversity of human moving behaviour in different specific sport situations. It is a continual pursuit of scientists, swimmers, coaches and sports staff for finding the ideal model of swimmers as it should be, with all its "ideal" anthropological characteristics, it would be best. For this purpose it is trying to improve current methods of training, measurement and diagnostic swimmers. Thus, the determination of anaerobic threshold practiced (Leko & Ružić, 1995), while (Bednarik et al., 1995) explored the relation between swimming speed using the established criteria for the round (the appearance of blood lactate accumulation) and competition results in various swimming events. Reliability speed swimming at the level of lactate threshold 4mmol.li critical swimming speeds were studied. Turqaj et al. (1995) and Kormanjoš et al. (1995) investigated the changes in the physiological-biochemical parameters in the swimming section of 400 m.

Troup (1995) considers constant current physiological aspects of swimming, and (Rinehardt et al., 1992) determined physiological changes untrained novice swimmers after a period of swimming training. (Bulgakov & Vorontsov, 1977) in their study were given high correlations between performance on the 100 m front crawl and static forces (0.606), dynamic (0.633) and hydrodynamic (0.703). Gualdo-Russo & Graziani (1993) made determination of anthropometric somatotypes of Italian athletes (including swimmers), a sample of 1593 young athletes (717 men and 876 women). Average somatotype athletes was 2,7-4,7-2,7 and 3,6-3,7-2,8 athletes, with the prevalence of mezomorph observed in all sports. (Barzdukas et al., 1992) observed the characteristics of growth and development of quality swimmers aged 13-16 years and determined that the biological age of the entire subsample of the study as a whole exceeds the average chronological age of about seven months. The fastest swimmers were the most difficult and possessed the highest degree of biological development. Significant correlations were observed between the results, body mass index, biological and chronological age. The most significant relationships were observed between swimming performance and biological age. The oldest girl, according to the expectations of the author, and were most mature physically. (Moreno et al., 1995) were investigated included 272 swimmers quality levels in the 100 and 200 meter events front crawl technique. The subject of this study consisted of determining anthropometric and technical scale swimmers.

Stager and Babington (1995) speak about the changes that occurred in U.S. swimmer in the last two decades, and considering the biological maturity. The population of competitors is now older and it seems that the sport is now dominated by those who would later mature and characterized by greater body height and shoulder width. If the year using the same methods are likely to receive the same results. Any person who is involved in swimming can create innovative strategies that in some way help in the development of swimming. Analysis of the causes of success is just a small part of competitive swimming, part of the constant desire for progress. It easily to general, it is difficult to think in new ways. Using other people's methods may at some time bring success, however, inventors, although a lot of effort, the ones that really leads forward. They are the ones who produce results. They are the ones who should promote competitive swimming in the future and create an "ideal" model swimmer should be as, if at all possible to make this "ideal" model with regard to the specifics of the swim. As in Bosnia and Herzegovina, there is relatively little scientific research papers in the field of diagnostics in swimming, so the idea of this paper is that he went swimming as a sport with a higher scientific level and raise the plateau of knowledge about swimming in B&H. Accordingly, the objective of this research consisted in the fact to determine the relation between the system variables set anthropological dimension in latent form and results of success in swimming, in young swimmers, representatives of B&H, in order to check their connection.

Methods

Testing was conducted on a sample of 10 (ten) swimmers, state representatives of B&H in swimming, the participants state championships B&H 2007th. For the final treatment results were included respondents who participated in the measurement and control in the competition and diagnostic testing after the championship. All fractal dimensions are undoubtedly a great influence in swimming, but not in equal volume. All these measures directly affect the buoyancy, resistance, body position in water, specific gravity, kinaesthetic sense, technique, style of swimming. Anthropological space is the one who is constantly researching and make models of "ideal" swimmers. Accordingly, the choice of variables, in order to swimmers in this study could give an objective description of anthropological space that it defines. This choice is made according to commonly accepted structural model of anthropological space. Since the analysis involved processing the data was used SRA regression analysis (Bonacin, 2004) to determine the relationship between the predictor variables (a set of fractal dimension in latent form) and the criterion variable (score in swimming). In order to ensure a series conclusions focused on the modelling parameters in swimming, and based on the previously performed analysis, created a regression analysis of the manifest space in a way that the results are condensed in individual sub-segments (spaces) to be placed in a position to predict the latent dimensions. The reason for this, it is realistic to expect that the latent circuits clearly answer the question of the final model swimmer. Therefore, we do a regression analysis, but in a way that previously isolated and described the factors that orthoblique factors as latent dimensions brought in connection with sports performance. This is due to determine the maximum possible model from existing data. Included were 16 latent dimensions or factors: three morphological, five isokinetic, two functional, two related to blood tests and four motor. All these factors together constitute a set of anthropological characteristics of swimmers in a way that they are connected and integrated into one unit.

Table 1. Latent dimensions of the condensed sub-segment individual circuits

Isolated latent variables					
	1)	2)	3)	4)	5)
MORPHOLOGICAL	longitudinal	adipose tissue	transversality		
ISOKINETICS	unoptimized biological coordination	inadequate synchronization	optimum knee joint performance	simultaneous work hocks	modern stroke
FUNCTIONAL	functional loading, the possibility of achieving	the ability of the heart			
BLOOD TESTS	indicators of healthy status	elements of the transport of oxygen			
MOTOR	timing and energy information arm	fixation coordination around mass center	function of the lower extremities	specific kinetic chain explosion in the water	

Results and discussion

The first thing is obvious is that the regression is significant; a multiple correlation is 0.93 with explained criteria of 87%. Therefore, it is very high determination regression with the help of isolated latent dimensions. Regression is, of course, important as it is no wonder, which means that such a set of parameters or variables may be in a very large extent explain the final result, which is especially important because it participates more and more sub-variables sub-dimensions. In Table 2, two parameters are particularly distinguished, among them especially FLD2 therefore systolic and diastolic blood pressure, and heart rate at rest. It would therefore be the most important indicator, of course not only not alone, because it does not mean that someone who has good value on this factor would be a good swimmer, he must have composed in everything else, and when everything is composed in it is the dominant thing. That's what we call in the narrow sense of immediate functional ability of the heart to perform work, especially in the parameters that are viewed as a systolic blood pressure and heart rate at rest. It is therefore perhaps the most important thing.

Tabela 2. Regression of variable TKET (latent)

VAR.	R	B	F (B)
ALD1	0.80	0.41	0.91
ALD2	0.07	0.04	0.04
ALD3	0.69	0.35	0.90
BLD1	0.20	0.10	0.28
BLD2	0.08	0.04	0.17
BLD3	-0.03	-0.01	0.33
BLD4	0.23	0.12	0.49
BLD5	0.04	0.02	0.28
FLD1	-0.58	-0.29	-0.83
FLD2	0.85	0.43	0.78
KLD1	-0.18	-0.09	0.01
KLD2	0.40	0.21	0.47
MLD1	0.63	0.32	0.71
MLD2	0.35	0.18	0.23
MLD3	0.54	0.28	0.65
MLD4	0.76	0.39	0.96

DLT=0.87, R=0.93, C=1.97, Var.=5.16, DF(1, 8), F=20.36, P=0.0023, P(Expected)=0.0031

Somewhere near it, with 0.41 first latent dimension morphology, it is what connects longitudinal-volume. When you perceive it is in approximately the same plane or approximately the same level of significance. So morphologically complex could not be any, but has its own logic, constituting a total dimensionality of the swimmers. The morphologically complex has a reason why it is such, selection and training to come to that and it's obviously in a relatively close relationship with functional ability, and not quite so accidental as it may seem at first glance. Somewhere near that, with 0:39 beta is the fourth motor factor thus explosive power in the water, and other predictors are going on. There is definitely a third morphological factor, namely the transverse dimensions of the distal limb segments; again this is obviously swimming ability. It does not appear to be ordinary population was thus constituted. At 0:32 is still the first motor factor that is working hand in support of the body, the active work of the hand and literally get a mild hierarchical division of what is important, then it is less important, etc. This is the model pursued in this study. In other words, how a swimmer if he wants to be champion has to look within all the dimensions that are taken into account. Yet there stands the FLD1, this is the first functional factor only on the negative. Maximum receive oxygen and volume to the total lung capacity, vital capacity. Because metric orientation or this is not negative. This means that it is positive and that it speaks about functional abilities, and as can be seen only by the functional space represented by the two factors that are included in this analysis. In course of morphological adipose tissue is insignificantly for prediction, and the remaining two factors, first and third are there. When factor mobility are all represented, but not equally. Motility factor of three, is active footwork is still a "decent" beta value of 0:28. One cannot fully exclude the second motor factor, but obviously it is below 0.20, which would in this case meant that there really fixation rather than an active role, as already described. So, first, third and fourth motor factor they have a direct active role in the result, and because they are here expressed to a greater extent. When blood tests to see first factor really has a greater influence on the result, and the other on the border, so it should not take into account the very particular, from which it concludes would probably greater attention should be paid to parameters of blood in training to it monitors the status of athletes, to see that because of certain elements in the periodization he changes in this respect but certainly not as crucial for the result. And finally we can conclude that the entire assembly isokinetics parameters, none of the five factors do not participate significantly in the result, the final result of these athletes. Generally you can say the following: In general no matter what is morphologically complex versus the result, indeed, it is very important as it is, that no matter what the motor circuit must be formed as a special circuit for swimmers, it is irrelevant what is the functional circuit because both factors proved significant. On the other hand, Isokinetics and blood tests showed no significant relations, which means that they should be used in training but not as direct control parameters of achievement. From this it follows, that according to this analysis, must be very careful on which way the train and in what way, in fact, changes in training athletes to achieving the target score, this table that is called regression to the variable t-ket latent space. The table actually shows what a model athlete in swimming we want, based on several components of morphological, isokinetics, functional blood count, or motor.

Conclusion

Model proposal should include swimmer exactly certain values of model parameters and a way to preserve the right information presented in the regression analysis of the latent dimensions as predictors. So it would be possible to achieve lasting value of basic indicators that lead to elite swimmers. Certainly not all the indicators we use in training just as valid for the projection of sports results. This study showed the direction in which to focus efforts and knowledge in order to model realistically is implemented. In this sense, this is avant-garde research and possible turning point that provides a whole new way of presenting possible models in swimming. Based on results, responsible for success in swimming can be considered functional abilities, especially the maximum admission of oxygen, and balanced systolic and diastolic blood pressure. Then, the optimal morphologic structure that tends specific swimming model, and also extremely well developed, but also a very specific set of colored motility differentiated in a manner that ensures an optimal action in the final specific medium. Finally, indicators of blood and isokinetic indices can be considered much less important for achieving results, but it is possible that may be important in the transformation process (training) in different phases. The research expectations, because according to the results obtained can be concluded that on the basis of the obtained parameters can be modelled as a swimmer should be to be top class. Based on the findings can be confirmed the hypothesis that states that the expected statistically significant correlation between a set of anthropological dimension of the latent form and results of success in swimming (Popo, 2009).

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MODEL ANTROPOLOŠKIH KARAKTERISTIKA ODGOVORNIH ZA USPJEH U PLIVANJU KOD MLADIH PLIVAČA

Sažetak

Na uzorku od 10 selekcioniranih plivača, reprezentativaca BiH, provedeno je istraživanje s ciljem pronalaženja onih antropoloških karakteristika koje su odgovorne za uspjeh u plivanju kod selekcioniranih plivača, reprezentativaca BiH u plivanju. U ovom redu prezentirani su rezultati analize utjecaja pojedinih antropoloških sklopova koji direktno utječu na rezultat u plivanju. Testirana je hipoteza da se očekuje značajna povezanost skupa antropoloških dimenzija u latentnom obliku i rezultatske uspješnosti u plivanju. Provedena je regresijska analiza, ali na način da su se prethodno već izolirani faktori odnosno orthoblique faktori, kao latentne dimenzije doveli u vezu sa sportskim rezultatom. To se radi iz razloga da se utvrdi maksimalno moguć model iz postojećih podataka. Uključeno je 16 latentnih dimenzija odnosno faktora: tri morfološka, pet izokinetičkih, dva funkcionalna, dva vezana za krvnu sliku i četiri motorička. Svi ti faktori zajedno predstavljaju skup antropoloških svojstava plivača na način da su povezani i integrirani u cjelinu. Rezultati ovog istraživanja pokazuju da za uspjeh u plivanju možemo smatrati funkcionalne sposobnosti, naročito maksimalni primitak kisika, ali i izbalansiran sistolički i dijastolički tlak. Zatim, optimalnu morfološku strukturu koja teži specifičnom plivačkom modelu, a isto tako i izuzetno razvijen, ali istodobno i vrlo specifično obojen motorički sklop izdiferenciran na način koji osigurava optimalno djelovanje u krajnje specifičniom mediju, kao što je voda. Konačno, pokazatelje krvne slike i izokinetičke pokazatelja možemo smatrati mnogo manje važnima za postizanje rezultata, ali nije isključeno da mogu biti važni u procesu transformacija (treninga) u pojedinim fazama.

Ključne riječi: *modeli, antropološke karakteristike, plivači, relacije, rezultat*

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