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STRUCTURE OF SOME RELEVANT BIOMEHANICAL PARAMETERS AND RELATIONS WITH SUCCESS IN THE WOMAN'S SWIMMING DISCIPLINE 200 METERS FREE STYLE STROKE

(Research note)

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Abstract

The research is conducted on a sample of 39 woman, top swimmers, participants in the discipline woman 200 meters freestyle stroke swimming, the swimming competitions of the Olympic games held in Sydney in 2000, which are applied and studied 11 relevant biomechanical variables recorded to swimmers. So applying regression analysis determined the impact biomehanical variables presented as predictorial on variables parameter, which is the final result (FRES). By applying factor analysis, showed that the structure of the biomechanical variables in the latent space and the extracted factors are presented as a system of predictorial variables and applying regression analysis determined the impact of variables parameters. Based on the analysis of the obtained results can be found all seven confirmed hypothesis set, which are treated as expected.

Keywodrs: *female,Olimpics, biomechanical variables, situational varijables, regression analysis, factor analysis, motor abilities, swim coach*

INTRODUCTION

Most striking example of the *frequent claims that the sport has emerged as one of the most important segts* of society everywhere in the world. Without doubt represented the biggest sporting spectacle ever held, called Olimpic Games, Sydney 2000. It confirms maximum number of participating countries, including our country, the maximum number of visitors to the games as most television viewers.

Bearing that in mind, the elemental question is, why is like that? Certainly the answer can be found in the fact that there are few areas of human creativity and action in which the goal is so precisely determined as it›s in sport, and that is sport result. The swimming sports that goal is eaven more rigorously defined: Certain sections in a particular discipline a particular technique of swimming to beat for as short time.

At the major swimming competitions, especially those such as the Olympics, swimmers (as indeed all the other athletes), perform with a single purpose of these matches to reach their maximum, their best sporting result and achieve the best ranking in their sporcareer. But in practice, it's not possible to manage them all for the simple reason that the top results in swimming are conditional and depend on numerous factors, primarily: individual physical and functional abilities; level of their general and special preparness; the overall conditions for optimal arrangements (facilities and devices; nonstop year-round job, educated and capable professionals) controlled and optimal nutrition; mode of sporting life, desire for continuousprogress and success, and other.

In conditions when all these factors into optimal and satisfactory measure being met, as is the case with swimmers, Olympians, who are filled with identical, just there to achieve their best score and ranking, however, the final result is conditioned with flawless execution of a whole range relevant biomechanical parameters, integral part of everyrace and one of these will be subject to our research.. Therfore, one of the most important components during the loug and painstaking process of preparing and matches the swimmers actually represents the identification of the biomechanical parameters, which are an integral part of every training an match. Therefore, by applying the appropriate analysis, and application of specpfichni exercises and methods during the training, can improve and perfect the relevant biomechanical parameters in satni of every race, but at the same time to eliminate possibly improving deficiencies.

The actual identification of the relevant biomechanical parameters of each race, is *the right information* to the coach and swimmer and able to properly analyze the results obtained in each segment of the race, along with frequency and amplitude of strokes. It helps in identifying

METHODS

The sample of respondents is defined as the top woman swimmers, participants in the swimming competitions of the Olympic Games held in Sydney in 2000, attended by 39 participants in the discipline woman freestyle stroke swimming, regardless of their age, which means that it is irrelevant. In defining the sample of respondents are not found any other restrictions.

The sample of variables composed of 11 biomechanical and 2 morphological. Biomechanical variables are: the final result, seconds (FRES), total swimming speed, m / sec (TOSW) of pure swimming speed, m / sec (PUSW) response time, seconds (REST) startup time , seconds (STTI) time of pure swimming, seconds (TPSW) frequency, number / min (FMIN) length of strokes, m (LESM) index of efficiency (INEF) turning time, seconds (TURT) and finish time, seconds (FINT).

In our study, the final result (FRES) is represented as criterion and the other biomechanical and morphological variables such as predictions. For the purposes of our research, for all applied variables, was calculated a basic descriptive statistical indicators: arithmetic environment, standard deviation, coefficient of variability, the minimum and maximum score.The interrelationship of applied and studied variables is determined by applying intercorrelation.

To determine the relation between criterion variable and applied system prediction variables is Applied linear Regressional Analysis, which will extract the following indicators: coefficient of determination (D); coefficient of multiple correlation (RO); coefficient standard error (SIGMA) , and coefficient of partial effects of variables on pradictors criterion variables (BETA).

For determining the structure of applied and studied biomechanical variables, factor analysis is applied.

To determine the influence of extracted factors on criterion varijables, Applied is regression of analysis in latent space.

Table 1. Characteristic roots and explained parts of the common variance of the applied system of variables

		% total	**Cumul.**	**Cumul.**
	Eigenval	Variance	Eigenval	%
1	6.098178	55.43798	6.098178	55.43798
2	2.402544	21.84131	8.500723	77.27930

RESULTS

Table 1 presents the characteristics of roots and percentage of variance objasnetata by the significant components in the space of first order. Thus extracted are two important components that explain 77% of common variance.

Table 2 presents the results of non-rotated factor mold of the applied system of biomechanical variables which suggests that isolated two factors it can be concluded that the applied system of biomechanical

Table 2. Non-rotated mold factor of variables

	From 1 Factor	From 2 Factors	Multiple R-Square
FRES	.919705	.954946	.999853
TOSW	.915597	.954753	.999849
PUSW	.845024	.864205	.954761
REST	.211891	.403041	.616143
STTI	.641952	.673055	.699834
TPSW	.775313	.795286	.946101
FMIN	.076335	.488049	.664326
LESM	.142069	.885129	.956277
INEF	.043320	.843095	.943165
TURT	.651026	.714705	.882297
FINT	.875947	.924460	.973755

Table 3. Rotated mold factor of variables

	Factor 1	Factor 2
FRES	.971385	.106567
TOSW	.972364	.096237
PUSW	.918762	.141712
REST	.309127	.554510
STTI	.712270	.407094
TPSW	.882630	.127473
FMIN	.072539	.694829
LESM	.102938	.935164
INEF	.067804	.915695
TURT	.845402	.000457
FINT	.959036	.068632

Table 4. Regresion analysis of variable FRES 100 freestyle stroke – woman's swimming in latent space

	BETA	Of BETA	B	Of B	t-test	Q (BETA)
FACTOR 1	.971385	.036950	2.9452	.112032	26.289	.000000
FACTOR 2	.106567	.036950	.3231	.112032	2.884	.106229
RO = 9.77	DELTA = .952		SIGMA = .219	F = 349.72		Q(F) = .000

variables explains the high percentage of variables in each variable separately.

Analysis of Table 3 showing the results of rotated factor mold applied and studied biomechanical variables and projections of the vectors of applied variables on orthogonal rotiranite varimaks factors, allows to determine that the two varimaks factors are extracted.

First extracted varimaks factor, determine the variable final result FRES, total swimming speed TOSW, swimming speed (measured in the phase of pure swimming) PURW, start time STTI ,) time of pure swimming TPSW, turning time TURT and finish time FINT, which can be defined as a factor specific speed and agility.

Second extracted varimaks factor is determined by the variable response time REST , frequency of strokes per minute FMIN, length of strokes LESM and the index of efficiency INEF, which can be defined as a factor of reaction, frequency, amplitude and efficiency of stroke.

By analyzing the table 04, which presents the results of analysis on variable FRES 200 freestyle stroke - woman swimming in latent space, based on the coefficient of multiple correlation (RO = .977) and level of significance of applied prediction. In case, isolated varimaks factors on the outcome of criterion variable can be determinedthat he has a significant impact. The coefficient of determination (DELTA = .952),suggesting that the applied variables, with 95.2% participate in explaining the variance of the criterion variable.

Based on the level of significance of partial impact on the outcome of the criteria variable Q (Beta = .000), it simply found statistically significant partial effect on the outcome of the criterion of the first extracted factor: specific speed and agility.

CONCLUSION

The research was performed on 39 woman subjects, top swimmers, participants in the discipline 200 meters freestyle stroke - woman swimming, the swimming competitions at the Sydney Olympics in 2000. To fulfill the purpose and objectives of the research, applied are 11 biomechanical variables recorded for each participant, and two morphological variables. For successful realization of goals and objectives of the research, applied appropriate statistical methods manifest and latent space (factor and regression analysis). It was found that the success of the 200 meters freestyle in the women's swimming , a statistically significant factor affecting the specific speed and agility.

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СТРУКТУРА НА НЕКОИ РЕЛЕВАНТНИ БИОМЕХАНИЧКИ ПАРАМЕТРИ И РЕЛАЦИІ СО УСПЕШНОСТА ВО ПЛИВАЧКАТА ДИСЦИПЛИНА 200 МЕТРИ КРАУЛ

(Истражувачка белешка)

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Апстракт

Истражувањето е извршено на примерок од вкупно 39 женски, врвни пливачики, учеснички во дисциплината 200 метри краул женско пливање, на пливачките натпревари на Олимписките игри во Сиднеј 2000 година. Применети се и проучувани 11 релевантни биомеханички варијабли, регистрирани кај пливачките. Со примена на регресиска анализа, утврдено е влијанието биомеханичкнте варијабли, претставени како предикторски, врз критериумската варијабла (конечниот резултат - КРЕЗ). Со примена на факторска анализа, утврдена е структурата на биомеханичките варијабли во латентен простор, а екстрахираните фактори, претставени се како систем на предикторски варијабли. Повторно со примена на регресивна анализа, утврдено е нивното влијание врз критериумската варијабла. Врз основа на анализата на добиените резултати може да се утврди дека се потврдени сите поставени хипотези на истражувањето.

Клучни зборови: *жени, Олимписки игри, биомеханички варијабли, ситуациони варијабли, регресивна анализа, факторска анализа, физички способности, пливачки тренер*

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