

Ontogenetic Laws in Sports Practice

Author's Contribution

A – Study Design
B – Data Collection
C – Statistical Analysis
D – Data Interpretation
E – Manuscript Preparation
F – Literature Search
G – Funds Collection

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Background:

For a long time we have studied the influence of individual peculiarities of the age development on achieving sports mastery. Our research showed a strong dependence of all aspects of an athlete's preparation on individual passing of the ascending stage in ontogenesis, including the choice of sports specialization, the dynamics of the growth of sport results, the age of the best achievement of athletes. The aim of this work was to prove the necessity of optimization of many-year sports preparation on the basis of understanding the role of epigenesis and the phenotypic peculiarities of an athlete's development in ontogenesis.

Material and methods:

The majority of our studies were carried out on the materials of the long-lasting examination of the athletes of many different age-and-qualification groups, mainly of the representatives of sports of a cyclic character (skiing, swimming). Pedagogical observation and research had the dynamic character mainly for more than three years. A retrospective analysis of investigation data was widely used.

Results/Conclusions:

The tempo-rhythmical peculiarities of passing of the puberty period define the spectrum of phenotypic changes thereby exerting an influence on the expediency of professional orientation in a high level sport. The specificity of the adaptive reactions in the zones of biologic maturity distinguished by us permit us to look at them from the position of especial sensitiveness of concrete system's mechanisms. These and other revealed facts of intercommunication between the processes of ontogenetic development and different aspects of sports activity oblige us to put a question about using the ontogenesis laws as regulators of long-term sports preparation.

Abstract

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Background

The past Winter Olympic Games in Torino do not cause simple emotions. On the one hand, the athletes undoubtedly cause the delight and admiration by their excellent participation and professional mastery, by strength of their fortitude and intellect. On the other hand, the organizers of contests directed their energies to create such conditions of competitions which led to a great risk for athletes not adequately raising the acuteness of spectator reactions. All this took place against the growth of the concurrency and of common level of achievements when sometimes the victory was nearly symbolic.

In struggle for Olympic medals the process of bitterness of a sports rivalry can hardly be stopped. In this connection the search for reserves of maximal optimization of a sports preparation independently the trainees' age or talent becomes more and more actual. We propose to consider the relation of ontogenetic laws with the processes of making of sports mastery both the base in building the athletes' preparation and one of the important criteria for the management of all its components [1, 2]. The aim of this work is to prove the necessity of optimization of many-year sports preparation on the basis of understanding the role of epigenesis and the phenotypic peculiarities of an athlete's development in ontogenesis.

Material and methods

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The complex of methods included: 1) anthropometric measurements and the definition of biological age (BA) with a 9-stage scale; 2) parameters of competitive performance and training loads; 3) a large spectrum of physiologic and biochemical characteristics of work-capacity; 4) tests of common and special fitness; 5) programs of computer data calculation and an analysis by means of methods of classification and the factor-typological description.

Results

1. Variativity of an individual rate of biological development

Our studies have shown essential differences in the pace and type of biological maturation of athletes in the same kind of sport and in its disciplines. In Table 1 elite young male wrestlers of age 13.5-16.7 were distributed according to their type of biological maturity and weight category. The lightest categories were represented by younger wrestlers mainly from the Caucasus mountains auls and from north-east regions of the country.

The presented data in selective samples emphasize the common tendency of distribution of athletes. Thus, in light-weight categories the wrestlers were represented by athletes with strong retarda-

Tab. 1. Representation of elite young male wrestlers of different weight categories depending on the types of biological maturation (%)

Weight categories (kg)	Free-style wrestling			Greco-Roman wrestling		
	R	N	A	R	N	A
41 – 43	78	22	-	90	10	-
44 – 45	66	17	17	80	20	-
56 – 58	2	43	55	36	55	9
64 – 66	10	20	70	46	46	8
74 – 75	-	18	82	-	36	64
84 – 87	-	-	100	-	20	80
87 +	-	9	91	-	55	45

Tab. 2. Age distribution of swimmers with different variants of pubertal maturation, % (the data of observation – Oct. 2003)

Age, yrs /prs	Retardation, > 1.5 yrs	Retardation, ≥ 1 ≤ 1.5 yrs	Norm for the given age, ±1 yrs	Acceleration, ≥ 1 ≤ 5 yrs
Girls				
11 (N=17)	5.9	41.2	52.2	Abs.
12 (N=43)	16.3	46.5	34.9	2.3
13 (N=37)	27.1	40.6	32.4	Abs.
Boys				
12 (N=3)	Abs.	100.0	Abs.	Abs.
13 (N=13)	7.7	38.5	30.7	23.1
14 (N=53)	11.3	26.4	45.3	17.0
15 (N=33)	9.05	9.05	45.5	36.4

tion in biological development on the whole. In categories with a great body mass the wrestlers with signs of acceleration of puberty dominated. The shift to the average rate of biological maturation is observed in ordinary weight diapason for the overall male population. In addition, we observed the greatest amplitude of individual differences in speed of passing of the puberty period just in the same categories. The differences of BA among athletes of every weight category were from 2.5 to 6 years. A comparison of the data in two kinds of wrestling with different competitive rules showed a definite influence of their specificity. We could also see the same tendency in the distribution of the types of puberty development in other kinds of sports of weight the categories (boxing, judo, sambo, and weight lifting).

In Table 2 the distribution of elite young swimmers of different age groups is presented in accordance with the types of their biological maturation. We can see a definite tendency in their distribution depending on their sex. The tendency to retardation of puberty development in female groups is obvious. In male groups swimmers with accelerated and normal rates prevail. As a result, the average values of BA in the same age group among representatives of both sexes are not distinguished. We received analogous data in running disciplines of track-and-field athletics. But the level of retardation in female groups was expressed more strongly.

It should be marked that the volume and intensity of the training loads depends on the trend of selective process of the preferable types of athletes' biological development.

2. The influence of biological age on the curve of sports result dynamics

The average values of the increment of results at competitive distances of 56 male free style swimmers and 27 female back stroke swimmers are presented in Table 3. The age of the highly-qualified male swimmers varied from 14 to 27. The studies were prolonged with changes of athletes' biological maturation not less than during three zones of BA. Both groups included only swimmers with results at all diapasons of distances. The male sprinters group was mainly represented by the accelerated contingent of swimmers. Long distance swimmers were characterized by later beginning and a more reduced rate of sexual maturation on the whole. Back stroke female swimmers of the age 13-21 represented in the tables, differed by a tendency to a tall and asthenic figure, average time of the beginning and a more prolonged period of puberty as a rule.

Tab. 3. The increment of sport results in different zones of puberty development (%)

Distance (m)	Zones of biological age, in balls							
	1 - 2	2 - 3	3 - 4	4 - 5	5 - 6	6 - 7	7 - 8	8 - 9
♂ 100	9.4	9.8	5.6	5.1	4.5	3.1	1.7	0.5
200	9.2	9.5	5.5	4.9	4.3	3.8	1.4	0.4
1500	4.0	5.8	4.4	4.0	4.3	3.1	0.4	-3.8
♀ 100	7.8	10.0	6.2	5.3	4.2	1.9	1.7	-1.2
200	7.1	9.9	5.6	5.5	3.6	1.4	-1.6	-1.0

A comparison of the increment indices of sport results (ISR) shows their conformity at the same distance and zones of BA for the swimmers of both sexes. But in every separate case the curve of ISR is highly differed. The training methodology and the psychosomatic constitution of a swimmer exert an influence on the character of the individual curve. The degree of a correspondence between a swimmer's constitution and the demands of the sports specialization, and also the character of the tempo-rhythmical peculiarities in passing of puberty have a particular role in the age dynamics of ISR.

Sprint swimmers were represented by athletes with intensive passing of the prepubertal phase of age development which was reflected in the highest indices of ISR. The 1500-meter swimmers passed the same phase 1-2 years later, and their ISR indices were the lowest. So the character of the individual curve of ISR permits us to evaluate the complex relation between the training process and individual peculiarities of age development.

3. Zones of biological development as indicators of sensitive period

The structural interaction in a wide complex of an athlete's individual signs with different values of BA give the opportunity to see the dominant trend of transformation in a human organism in every separate moment of ontogenesis. Their character and direction are defined by the athlete's phenotypic peculiarities. The phenotypic peculiarities are realized under the influence of the terms and duration (intensity) of proceeding of zones of biological maturity displayed as typological features.

Discussion and Conclusions

The problem of humanization of sport is actual today as never before. This problem especially concerns children and youth. The dependence of sports preparation on the directives and coach's dictates is turned out by irrational forcing of the training process and a mass elimination of young athletes caused by a negative attitude to the modern practice of the sports occupation as a whole [3, 4]. Not less important aspect of optimizing the methods of the sports preparation is connected with the evident shift of the processes of phenotypic mutability to astenization of the constitution of the modern generation and more prolonged period of biological maturation [5, 6]. Such changes in processes of phylogenetic development human's cause the extension of individual variances of ontogenesis passing. With all progressive tendencies of this process, the role of physical activity is essentially increased not only in normal age developing but in developing the really active citizens.

References

1. Timakova T. S. *Mноголетня́я подгото́вка пловцов и ее индивидуализация (биологические аспекты)*. *Fizkultura i Sport, Moskva 1985*, 145.
2. Timakova T. S. *Vliyaniye tipologicheskikh osobennostey yunikh plovцов na vozrast otseva (dannii retrospektivnykh issledovaniy)*. In: Neverkovith S. [Ed.] *Sbornik nauchnykh trudov po zimnim vidam sporta, VNIIFK, Moskva 2002*, 282-290.
3. Schmidt W. *Changes and Trends in Children's Sport Career Development*, In: *Book of Abstracts. The 6-th Annual Congress of the European College of Sport Science „Perspectives and Profiles“ (Cologne, 24-28 July 2001) 2001*, 59.
4. Timakova T. S. *Osobennosti biologicheskogo pazvitiya liznitc visokoi kvalifikatsii* In: Martinov V. S. & Kazikov R. F. [Ed.] *Sbornik nauchnykh trudov po zimnim vidam sporta. Fizkultura i Sport, Moskva 2006*, 157-175.
5. Nikitiuk B. A. *Integratija znanij v naukakh o tseloveke (sovremennaya integrativnaya antropologiya)*. *SportAkadem-Press, Moskva 2000*, 440.
6. Godina E. Z. *Dinamika protsessov rosta i razvitiya tseloveka: prostranstvenno-vremennii aspekti (dissertation)*, *Moskva 2001*.

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