

Properties of Motor Development in Young Judokas

by

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The objective of the undertaken study was to determine properties of motor development of 224 judokas aged 11 to 17. The basic criterion for selection of athletes to the experimental group was the conformity of their calendar and biological ages.

Measurements of motor abilities were executed based on the International Physical Fitness Test. A control group was provided by results of tests of ca. 200 000 boys who were regularly participating in sport of any type (Pilicz et al. 1993).

Through such directed tests it was possible to define the chronology in the rate of motor development among our subjects. Such an analysis had to take into consideration three basic elements: absolute values of testing results, significance of their differences and the rate of annual accruals.

Key words: youth, judo, motor development

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Introduction

The problem of motor development in children and youth is in the focus of attention of scientists in numerous countries (Guzalowski 1977, Wołkow 1981, Jagiełło et al. 2001, Jagiełło 2002). In sciences related to physical education and sport it is presumably one of the most frequently analysed issues. Numerous studies, including Wolański and Parizkowa (1976) and Šemetka (1982) have proven that motor development of children and youth is characterised by certain features that are connected with biological regularities in the development of a human. Those regularities have been well-studied and extensively presented in the available literature. However those studies concern children who were not subjected to systematic training loads.

There is little data concerning properties of motor development in children practicing a given sport discipline in modern literature. Such information is of utmost importance particularly in relation to sportsmen. From the point of view of energy expenditure in the physical development of young athletes, we are faced with two opposing processes.

On the one hand, energy is used for plastic processes i.e. processes related to growth, differentiation and maturity of the organism, and on the other hand, training loads also lead to significant demand for energy. A training program which is incorrectly executed, with excessive loads, may cause some violation of biological regularities in the development of athletes.

Consequently the objective of the undertaken study was to determine properties of motor development of judokas aged 11 to 17.

The following research questions were formulated:

What is the level of motor abilities of judokas aged 11-17?

Does the motor development of judokas progress according to the biological regularities which are characteristic of children and youth of the same age who do not practice sport regularly?

An additional objective of the work was to establish a theoretical base for planning training loads for young judokas.

Material and methods

The research material involved 224 judokas aged 11-17. The basic criterion for selection of athletes to the experimental group was the conformity of their calendar and biological ages.

Measurements of motor abilities were calculated with the use of the International Physical Fitness Test. The testing was performed between 1996 and 2001 at the beginning of each preparatory period within a macrocycle. A control

group was provided by results of tests of ca. 200 000 boys who were not competitive athletes (Pilicz et al. 1993).

The dynamics of changes taking place with age was studied through a calculation of values of annual accruals according to the formula:

$$T=100(P_1-P_2)/(P_1+P_2) \%$$

Clarification: T – accrual value; P₁- initial result; P₂- final result

To determine the activity level in the development of motor abilities, the following criteria were adopted:

high level of activity – $>x + Sx$, as well as significance of differences confirmed in a statistical way;

average level of activity – $x \pm Sx$;

low level of activity – $< x - Sx$.

Microsoft Excel 2000 was used to process the obtained data. The following characteristics were calculated: mean arithmetic value (\bar{x}), standard deviation (Sx), coefficient of variation ($V\%$), correlation coefficient (r), significance of differences. Statistically significant differences between students were measured.

Results

The development of motor abilities in young judokas progresses in a non-uniform way. Taking into consideration absolute values of the considered tests, young judokas achieved better results than children not practicing sport (in the period included by studies). An example of various exercise dynamics in absolute values of results achieved in attempts of judokas, as compared to children who did not practice sport was presented in Fig. 1.

Taking into account changes that take place with age in motor abilities, the dynamics in the rate of their development was defined (Fig. 2).

Through such directed tests it was possible to define the chronology in the rate of motor development of judokas aged 11 to 17 (Table 1). Such an analysis had to take into consideration three basic elements: absolute values of results, significance of their differences and the rate of annual accruals.

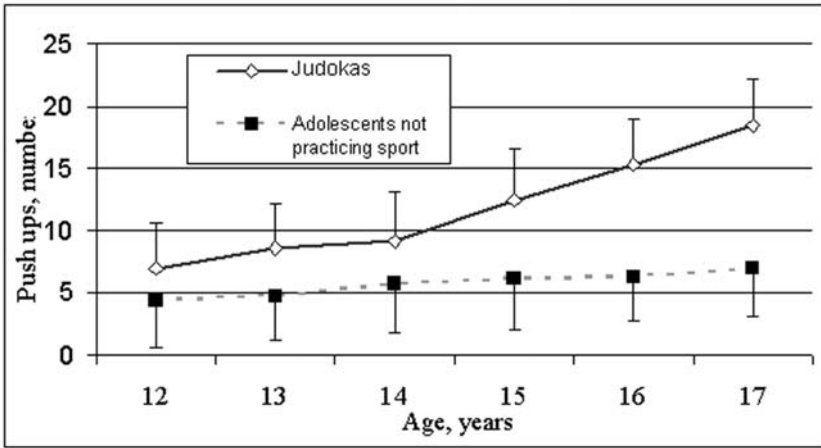


Fig. 1

Dynamics of results in chin ups on a bar of judokas and children not practicing sport

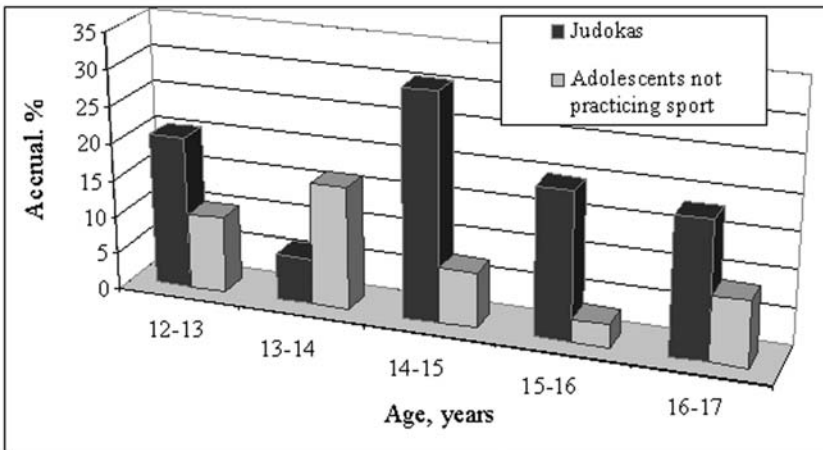


Fig. 2

Dynamics in the rate of accrual for results in chin ups on a bar of judokas and children who do not practice sport

Table 1

Chronology in the rate of motor development of young judokas

Age groups	Motor ability							
	Speed	Speed and strength abilities	Hand strength	Strength of abdomen muscles	Strength endurance	Aerobic endurance	Agility	Flexibility
	Tests							
	50 m run	Long standing jump	Hand strength	Sit-ups from prone position	Chin up	1000 m run	4x10 M run	Bend of the trunk forward
11-12	Medium	Medium	Medium	High	Low	Medium	High	High
12-13	High	Medium	High	Medium	Medium	Medium	Medium	Low
13-14	Low	Medium	Medium	Medium	Low	Medium	Medium	Medium
14-15	High	Medium	Medium	Medium	High	High	Medium	High
15-16	Medium	Medium	Medium	Medium	Medium	Medium	Low	Low
16-17	Low	Low	Low	Medium	Medium	Low	High	Medium

Clarifications: - high level of activity; - medium level of activity; - low level of activity.

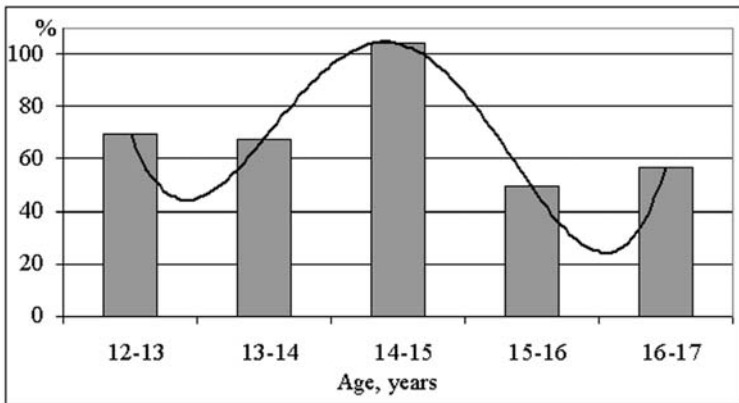


Fig. 3

The summary rate of development ($\Sigma\%$) of motor abilities in young judokas

An analysis of the energetic potential of young judokas expressed by the index of the summary rate of motor ability development (in percent of annual accruals) pointed out periodical fluctuations in strength and endurance abilities

in athletes whose bodies are still developing (Fig. 3). In the studied period of motor development of young judokas, two periods of the highest activity were observed: 11-12 and 14-15 years.

Discussion

The motor development of young judokas is a long-term process, in which the main role is played by two mutually, closely correlated factors: the biological and the social factor (Wolański 1981). Such a state of affairs imposes the necessity of close respecting of general regularities in the biological development of an individual, as well as individual capabilities of athletes.

An analysis of our result tested motor abilities in judokas aged 11-17, and the rate of their accrual confirm the heterochronic character of their motor development. With regard to age each of the motor abilities tend to develop according to a specific pattern, with periods of high developmental activity, low developmental activity or stabilisation. Such a situation fully conforms to results of earlier studies conducted on material of children who were not practising sport (Guzalowski 1977, Wolański and Parizkova 1976, Wołkow 1981).

The authors have emphasised that the highest rate of motor developmental abilities may be observed in the younger and medium school age. That is why in that particular period they recommend differentiation of training means directed at developing particular abilities in a thorough way, conforming to the needs of the organism. One should also bear in mind that sensitive periods are determined, to a large extent, by the rate of biological development, which all the more importantly requires an appropriate differentiation of applied training means (Jaskólski et al. 2005). The chronology of the developmental rate of motor abilities ascertained during tests performed on judokas may constitute a theoretical premise for such planning of training loads.

A characteristic feature in the development of motor abilities in the studied judokas is their much better balanced development – without leaps or excessive accelerations (Jagiello et al. 2001, Jagiello 2002). During the analysed period, judokas had five times more periods with a moderate development rate, as well as seven times fewer periods with highest rate of development and much fewer subcritical periods (Jagiello 2002). This is due to the fact that under directed training loads the level of absolute results obtained in testing of young judokas is higher than the one in children who do not practice sport and consequently – (taking into account the higher level at the start) the dynamics of annual accruals tend to progress in a much more balanced way. This becomes particularly clear for speed and strength abilities which are characteristic of judo.

The analysis of the energy potential of young judokas has also confirmed periodical fluctuations of the strength and endurance abilities of judokas.

Studies conducted by Wołkow (1998) have proven that children and youth have three periods of particularly high activity in the development of motor abilities: from 8 to 9 years, from 10 - 12 years, and from 13 - 14 years. Differences in relation to judo contestants concern only the third period, the occurrence of which was ascertained in our studies to take place much later – at the age between 14-15 years. This was due to the directed training, during which speed and strength abilities were being developed in an especially active way, hence allowing a high summary rate of growth of motor abilities at that age.

In those periods we observe a gradual collection of energy surplus, which in a given age is used for developing particular systems and of the entire organism (Jaskólski et al. 2005). For this reason it seems that from a biological viewpoint an increase in general value of training loads of judokas ages 11-12 and 14-15 years, and a decrease in the remaining periods is fully justified.

Conclusions

1. Systematic training of young judokas does not violate biological regularities in the motor developmental characteristics of children who do not practice sport.
2. Through directed training loads the level of absolute results obtained in testing young judokas is higher than in children who do not practice sport and consequently (owing to a higher initial level) the dynamics of annual increases progresses in a more balanced way.
3. Development changes of the studied traits (expressed by absolute testing indices and rate of their increase) confirm the heterochronic character and the sensitivity of motor development in young judokas.
4. Training leads to changes in the developmental rate of motor abilities in young judokas. Despite the general chronology of sensitive developmental periods, characteristic of children who do not practice sport all is maintained in young judokas. They differ only by the degree of distinctiveness.

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