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*Maintaining children in a good health state by means of individual
adjusting of physical exercise according to their biological
developmental status*

**Indywidualizacja obciążeń fizycznych
w zależności od tempa rozwoju biologicznego dzieci i młodzieży
jako czynnik sprzyjający zachowaniom prozdrowotnym**

**Возможности поддержания состояния здоровья
у детей при помощи индивидуальной дозировки
физических нагрузок в зависимости
от их темпов биологического развития**

INTRODUCTION

Recently the investigators came to a conclusion that actual changes in children's physical development are of irreversible character. Nowadays the majority of school children are biologically developed only in 40 – 70% of their possibilities. Existing differences in biological development required proper studies on adjusting of children's physical education to the ontogenic and typological peculiarities of various functional systems of their organisms.

MATERIAL

Authors investigated 417 schoolboys at the age of 13 – 17 years presenting various biological developmental statuses: accelerated, normal and retarded. The per cent rates were as following: 25 % accelerated, 50% normal and 25% retarded approximately.

METHODS

Following methods of investigation were applied: the anthropometric, physiological, biochemical and mathematical. For perfecting of strength skills repeated tests with load of 70-80% maximal were performed [1-3, 5] with regard to status of the children from the weakest group [1]. In school program speed abilities are tested during a 100-m run. For perfecting such skills repeated 30-m run in motion was performed [1]. For perfecting of speed – strength abilities the repeated long jump was performed, as it is also an element of school program [1, 4]. The results were processed by statistical methods with the use of Student's „t' criterion.

RESULTS AND DISCUSSION

Our investigations revealed that among investigated schoolboys of various age groups the most effective in carrying out physical exercises on endurance, strength, speed and speed-strength were children normally (in biological sense) developed and those who were above average. However children developed below their metrical age carried out the exercises considerably worse and more slowly. The restoration after physical exercises had prolonged duration period in those children.

As a result of individualised training a considerable and statistically verified rise of children's sport results could be seen (Tables 1, 2, 3). Our data are generally agreeing with the results found in scientific literature [7, 8].

Table 1. Distance (in meters) which tested children covered for 5 minutes during 1st and 12th training exercises (M±m). *) - P<0.05

	1 st	12 th
I	2733 ± 21	3012 ± 30*)
II	2763 ± 28	3018 ± 33*)
III	2711 ± 27	3034 ± 41*)

Table 2. Number of pull-ups on horizontal bar that tested children carried out in 1st and 12th training exercises (M±m). *) - P<0.05.

	1 st	12 th
I	3.5 ± 0.3	7.3 ± 0.4*)
II	3.2 ± 0.2	7.5 ± 0.4*)
III	3.1 ± 0.3	7.0 ± 0.3*)

Table 3. Speed (in sec) during 30 m run in motion that tested children carried out in 1st and 12th training exercises (M±m). *) - P<0.05.

	1 st	12 th
I	8.2 ± 0.3	10,3 ± 0.3*)
II	9.9 ± 0.3	12.2 ± 0.3*)
III	7.9 ± 0.3	10.6 ± 0.3*)

As a result of our scientific investigation we determined the initial parameters of physical exercise which are directed at the development of endurance, strength, speed and speed-strength skills in every investigated age – typological groups. It is believed that the obtained experimental results may be the basis for the further application in system of physical education in school. The authors' data allow promoting the healthy way of life in the coming generation at least in the field of physical health.

CONCLUSIONS

1. The correlation between physical and sexual development as well as somatic type was established, which made it possible to create a complex estimation of the morphofunctional biological development of schoolboys.
2. On the basis of complex estimation three main typologic groups were found:
 - I – accelerated development type (individual development outstrips individual metrical age). Accelerated children are characterised by faster physical development and more accelerated sexual development;
 - II – normally developed type, normal (individual development corresponding to individual metrical age). Children in this group are characterised by the average physical development and normal sexual development;
 - III – retarded development type. Retarded children's physical development is below the average for the age and more their sexual development is delayed.
3. The initial criteria of physical exercise that were directed on the development of endurance, strength, speed and speed-strength skills mainly had the individual character for each age-typological group.
4. Individual adjusting of physical exercise directed on the development of endurance, strength, speed and speed-strength skills with regard for the dynamics of individual working capacity allowed to optimise the didactic process, rise pupils' interest in physical exercises and in general promote the healthy way of life for the coming generation.

LITERATURE

1. Глазирін І.Д., Войнар Ю.: Фізичний розвиток і фізична підготовка юнаків-старшокласників. Черкаси, Відлуння-Плюс, 2002, 144 с.
2. Луговиков В.Б.: Определяя нагрузки на уроках физической культуры. Физическая культура в школе, 1989, № 5, С.15-17.
3. Ратушная Л.И.: Для комплексного развития двигательных качеств у юношей старших классов. Физическая культура в школе, 1985, № 12, С.32-33.
4. Рошупкин Г.В., Гогин А.В. Прыжки в IX-X классах. Физическая культура в школе, 1989, № 9, С.14-17.
5. Чернов Ю.А.: Развивать физические качества у юношей IX-X классов. Физическая культура в школе, 1988, № 10, С.23-27.
6. Cooper К.: The New Aerobics. New York, M.Evans Co., 1970, 347 p.

7. Kemper H.C.G.: Longitudinal studies of health and fitness of teenager and the interaction with sports activity. *Medicina Sportiva*, 1999, v. 3, N 2, P.85-102.
8. Laska-Mierzejewska T.: Interrelationship between body build and maturation rate as a tool in sport selection. *Proc. 3rd Internat. Sci. Congr. "Modern Olympic Sport"*, Warsaw, Poland, Aug. 29 – Sept. 1, 1999. – *Wychowanie Fizyczne i Sport*, 1999, v. 43, N 1, P.83-84.

STRESZCZENIE

Autorzy przeprowadzili badania na grupie 417 uczniów w wieku 13 – 17 lat, o przyspieszonym, normalnym lub opóźnionym tempie rozwoju biologicznego. Grupa charakteryzująca się przyspieszonym lub normalnym rozwojem najlepiej wykonywała ćwiczenia ukierunkowane na wytrzymałość, siłę i szybkość. Uzyskane wyniki pozwalają wyciągnąć wniosek, że szeroki zindywidualizowany wachlarz obciążeń fizycznych może przyczynić się optymalizacji procesu dydaktycznego, wzrostu zainteresowania aktywnością fizyczną i kształtować prozdrowotne zachowania dorastającego pokolenia.

SUMMARY

The authors investigated 417 schoolboys at the age of 13 – 17 years presenting various biological developmental statuses: accelerated, normal and retarded. The most effective performance of physical exercises on endurance, strength, speed and speed-strength was observed in normal and accelerated group. Individual adjustment of various kinds of physical effort should allow to optimise the didactic influence, to rise pupils' interest in physical recreation and in general to shape a healthy model of life for the next generation.

РЕЗЮМЕ

Обследовано 417 детей в возрасте 13-17 лет с разными темпами биологического развития: акселераты, нормально развитые и ретарданты. Показано, что наиболее эффективное выполнение физических нагрузок, направленных на развитие выносливости, силы, скорости и скоростно-силовых качеств, наблюдалось у нормально развитых детей и акселератов. Дифференциальная дозировка физических нагрузок различной направленности способствовала оптимизации педагогических воздействий, значимости физических тренировок в возрастании к ним интереса детей и, вообще, в формировании здорового образа жизни у подрастающего поколения.