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EFFICIENCY OF IMPLEMENTATION OF THE CONCEPT OF HEALTH-FORMING TECHNOLOGIES IN THE PROCESS OF ADAPTIVE PHYSICAL EDUCATION FOR SCHOOL-AGE CHILDREN WITH HEARING IMPAIRMENTS

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Author contribution: A – study concept and design; B – data collection; C – data analysis and interpretation; D – paper writing; E – paper editing; F – paper final adoption.

Abstract

Introduction. Modern scientific view and analysis of recent studies shows that the study of changes in the physiological mechanisms of the hearing system of a child with hearing impairment, which interact and affect the auditory sensory system, is of great importance to justify the introduction of effective methods of correction of motor disorders.

Aim — to test concepts and determine the efficacy of health-forming technologies in the process of adaptive physical education for school children with hearing impairment.

Methods: analysis and generalization of data of special scientific and methodical literature; monitoring of information resources of the Internet; sociological methods (questionnaires); method of copying (review and selection of materials from medical records); pedagogical methods (pedagogical testing, pedagogical experiment), methods of mathematical statistics.

Results. The concept of health-forming technologies in the process of adaptive physical education of school-age children with hearing impairments is developed and practically tested. The methodological basis of the author's concept within the framework of the scientific theme was united by three technologies of health formation of different orientation.

Conclusions. The received data confirmed that as a result of research and experimental work the efficiency of the author's concept of health-forming technologies in the course of adaptive physical education of school-age children with hearing impairments was proved. It was based on the development and testing of a conceptual model, and our proposed innovative technologies allowed to ensure the unity and interconnection of the blocks of this model in order to promote health-promoting activities of children with hearing impairments in the process of adaptive physical education.

Keywords: concept, technology, health formation, hearing impairment, schoolchildren, children, correction, physical development, physical condition, health.



Introduction. The loss of hearing, especially when the pathology is determined at birth or its indicating at an early age, it has a negative effect on development of physiological systems of the human body, developing their consciousness and individuality, impedes social, communal and psychological adaptation [6, 8, 13].

Modern scientific view and analysis of the recent studies shows that the research of changes in the physiological mechanisms of the body systems of a child with hearing impairments, which interact and affect the auditory sensor system, is of a great importance not only for diagnosing the range of disease and state of complications but for substantiating the introduction or selection of the effective methods of motor disorders correction already implemented among the representatives of this nosological category [2, 6, 11].

Specialists make accent that full development of the children with hearing impairments is impossible without physical education to achieve not only necessary level of physical development but disorders correction of different spheres of a activities of a child with hearing impairments. It is realized due to including new means and forms of motion activities in the physical education process setting the priority projection to health-development [7, 10, 12].

The given theoretical foundations caused the relevance of our conducted studies with accordance with the Composite scientific and research work plan in the sphere of physical education and sports for the years 2016-2020 approved by the Ministry of Education and Science of Ukraine developed in

National University of Ukraine on Physical Education and Sport according to the topic 3.23: «Health-developing technologies in the course of adaptive physical education» (state registration number 0116U001620).

The aim of the work is to test and determine the efficiency of health-developing technologies in the course of adaptive physical education for school children with hearing impairments.

Material and methods: To resolve the given aim of the study we used the following methods: analysis and generalization of data of special scientific and methodologic literature; monitoring of information resources of the Internet; sociological methods (questionnaires); method of copying out (review and selection of materials from medical records); pedagogical methods (pedagogical testing, pedagogical experiment), methods of mathematical statistics.

The study was conducted based on National University of Ukraine on Physical Education and Sport as well as Kyiv special comprehensive boarding school for the children with hearing impairments № 9, Kyiv special comprehensive boarding school for the children with hearing impairments № 18, Kyiv special comprehensive boarding school for deaf children № 6, and Bila Tserkva special comprehensive boarding school for deaf children.

236 students aged from 13 to 19 with different innate or acquired hearing impairments took part in the study. The organization of the study included three stages: the first stage was analysis of modern literary sources of state and foreign authors to assess the general state of the issue, determine the aim of the paper, define the research program and



develop sociological research methods; the second stage was to organize and conduct the indicative experiment to receive new theoretical and experimental data regarding determination of the level of physical development, physical performance and theoretical preparedness of the children with hearing impairments; the third stage was scientific substantiation of the development result and assessment of the efficiency of implementation of the concept of health-developing technologies in the course of adaptive physical education of school-age children with hearing impairments (formative experiment); and the fourth stage was to mathematically process the data, formulation of conclusions and practical recommendations.

In the course of completing mathematical analysis of data the statistical reliability was considered $P=95\%$ (5% error probability that means significance level is $p=0,05$); mathematical processing was conducted on personal computer using program software MS Excel XP, Statistica 6.0 created by Microsoft, Statsoft (USA).

Experimental records were approved by the committee of ethics of National University of Ukraine on Physical Education and Sport. According to ethical norms, all participants gave voluntary written consent for participation in all stages of pedagogical experiment for further analysis and disclosing of their personal data while interpretation and publication of the study findings.

The research was carried out in accordance with the main bioethical principles.

Results of the research and discussion. «The concept of health-

development» is a structured system of theoretical statements and practical forms, methods and means of development of creative strength of a personality aimed to create and develop the state of moral, psychological and physical well-being of a human learning to develop, preserve and enhance public health [14, 15].

Studying pedagogical basis of creating conditions for providing physical, mental and social well-being of children and teenagers with hearing impairments allowed us to develop the basic statements of the concept of health-developing technologies in the course of adaptive physical education of school-aged children with hearing impairments [7, 13].

The concept of health-developing technologies in the course of adaptive physical education of school-aged children with hearing impairments is first of all aimed to awaken thinking different from the rational and pragmatic one with being based on deep understanding of the sense of the embedded health-development ideas; lacing with insight of the realization principles of the basic objectives and concepts of accomplishing health-developing activities in the course of adaptive physical education [7, 13].

The suggested concept is intended to found the basis of health-developing activities, the realization of which includes the regime of creative development of one's own ideas and experience of an individual teacher and the staff of a specialized educational institution for providing understanding of the concept of adaptive physical education.

This direction of activity constitutes an author's variant having the

main component of which is the analysis of scientific and practical experience on development and implementation of innovative technologies into education system of specialized educational institutions aimed to develop theoretical knowledge and practical skills as well as motivation of the children with hearing impairments to do physical exercises and hence to provide the priority in their personality's development towards health promotion and preserving both for personal health and understanding the responsibility for the health of the whole society identifying oneself as its full member.

The methodological basis of the author's concept within the presented scientific topic was formed by developed and almost tested innovative means of health-development in the course of adaptive physical education of children with hearing impairments.

Thus, the collaborative work with the candidate of science in physical education and sport, the teacher of the department of biomechanics and sports metrology of National University of Ukraine on Physical Education and Sport, junior researcher of research and organizational unit of science and research institute of National University of Ukraine on Physical Education and Sport Tetiana Rychok as part of her thesis work gave an opportunity to develop and practically test the technology of correction of physical state indicators of school-aged children with hearing impairments using the means of tourist multidiscipline competition [1].

The data received in the course of indicative experiment and the determined direction of the stages of practical realization of the theory itself

allowed development of methodologic basis of the author's technology consisting of the module in correction and development work «Tourist multidiscipline competition» implemented in educational and extracurricular processes of physical education of middle-aged schoolchildren with hearing impairments [1].

The content of the module in correction and development work «Tourist multidiscipline competition» includes integrated approach to organization of work with schoolchildren of 8th grades with hearing impairments to learn some types of tourism in special comprehensive educational institution for one year. The module included the following thematic clusters: local history; topography and orienting basics; initial touristic training; hiking, etc. [1]

Implementation of the developed technology in the process of physical education of a special boarding school allowed achieving the following results: in the course of transforming experiment the number of calls for medical aid reduced from 3.78 times a year to 1.17 times a year for one schoolchild on average; at the end of the experimental year they fixed the changes in the structure of sickness rate among schoolchildren where the number of fallings sick reduced considerably at the level $p < 0.05$; positive changes occurred in calculated values of Quetelet index; average index values reduced in the group of boys from $348.20 \pm 0.33 \text{ g} \cdot \text{cm}^{-1}$ to $311.70 \pm 0.26 \text{ g} \cdot \text{cm}^{-1}$, and among girls – from $372.40 \pm 0.35 \text{ g} \cdot \text{cm}^{-1}$ to $321.60 \pm 0.25 \text{ g} \cdot \text{cm}^{-1}$, which maximally brought the received results nearer to norm indicator; dependable reduction of Robinson index calculated



values occurred ($p < 0.05$); average values of birth-death ratio among schoolchildren changed in the direction of their considerable improvement in the course of the experiment, especially they enhanced among girls from 32.29 ± 6.77 ml·kg⁻¹ to 46.37 ± 5.26 ml·kg⁻¹, dependable increase of the results towards the force index indicator both among boys and girls was revealed ($p < 0.05$); positive changes were observed in the level of manifestation of physical performance as well as general endurance as after the experiment finished the vast majority of both boys and girls also showed average level of physical performance (boys – 50.00 % and girls – 41.67 %), yet none of the examined schoolchildren appeared to be on the low level but on the contrary the schoolchildren with high level of physical performance appeared; the dynamics of positive changes occurred by the Ruffier index indicator, the number of the students having «satisfactory» grade reduced both among boys from 57.14 % to 14.29 %, and among girls from 58.33 % to 8.33 %, the schoolchildren with the «excellent» grade appeared; the level of manifestation of space orientation and static balance with eyes closed and open dependably improved (from mid to sufficient level) ($p < 0.05$) [1].

Separately, also within completing thesis research with a doctoral candidate of sports medicine unit, the teacher of the sports games unit Maksym Hopei the technology of increasing the physical performance level of school-aged children with hearing impairments using elements of sports-oriented physical education (exemplified by streetball) was developed and implemented in the course of adaptive physical education.

The program of educational and correction work «Streetball» was taken as a methodological basis of the suggested technology [3, 4].

The efficiency assessment of the suggested author's technology was executed in accordance with change of the criteria data in four groups of the 16-year-old schoolchildren with hearing impairments examined mentioned above: control group of boys (CGB) - 8 schoolchildren; control group of girls (CGG) - 10 schoolchildren; experimental group of boys (EGB) - 9 students; experimental group of girls (EGG) - 9 students. On the PE lessons (2 hours a week) and on the additional hours offered for school subjects, elective and individual classes and tutorials the schoolchildren of the experimental groups were exercising according to our developed program of educational and correction work «Streetball». The CG students were exercising according to the PE program approved by the educational unit of Kyiv special comprehensive boarding school for the children with hearing impairments [3, 4].

The comparative analysis of the received data in the course of formative experiment proved the efficiency of the novations developed and implemented by us: the dependable changes occurred in the direction of general physical preparedness improvement according to the indicators of agility manifestation by the results of the «Beep test» (EGB before the experiment - 11.34 ± 0.37 s (average level), after the experiment - 10.51 ± 0.42 s (sufficient level); EGG before the experiment - 12.26 ± 0.22 s (beginner level), after the experiment - 11.49 ± 0.57 s (sufficient level); CGB before the



experiment - 11.43 ± 0.21 s (average level), after the experiment - 11.59 ± 0.27 s (beginner level); CGG before the experiment - 12.28 ± 0.19 s (beginner level), after the experiment - 12.49 ± 0.23 s (beginner level)), speed manifestation by the results of the test «100 m run» (EGB before the experiment - 16.18 ± 0.14 s (average level), after the experiment - 15.91 ± 0.64 s (sufficient level); EGG before the experiment - 18.64 ± 0.48 s (beginner level), after the experiment - 18.19 ± 0.57 s (sufficient level); CGB before the experiment - 16.43 ± 0.21 s (average level), after the experiment - 17.09 ± 0.27 s (average level); CGG before the experiment - 18.67 ± 0.36 s (average level), after the experiment - 19.03 ± 0.51 s (average level)). Dependable changes occurred in the level of special physical and theoretical preparedness manifestation, indicators of psychophysiological status of school children of two experimental groups while comparing before and after the experiment and compared to the control groups data. Due to the results of the studies conducted by us the qualitative increase of functional disorders, acute and chronic somatic illnesses, maladaptation syndrome, development disorders at birth, and morphofunctional deviations among children with different hearing impairments was revealed in the course of conducting the indicative experiment. After the formative experiment had finished the level of general sickness rate decreased by 24 % among the children of experimental group. It is also worth to remark positive changes towards the level of communicative abilities among the examined children (by 47 % on average), motivation towards healthy lifestyle (by

38 %), and positive attitude towards their own health (by 56 %) [3, 4].

Based on the given results executed in the course of the indicative experiment we developed and suggested for implementation the health state correction technology of and lowering the risk of ecology-caused pathology emerging among the children with hearing impairments [5, 9].

The efficiency assessment of the technology suggested by us was executed according to the change of the data of given criteria in two groups of the examined students: control group (CG) of 11 schoolchildren (6 boys and 5 girls) aged 13 years old and studying in the 7th form; and experimental group (EG) of 12 schoolchildren (7 boys and 5 girls) of the age group corresponding to the control group [5, 9].

The implementation of the health state correction technology and the lowering the risk of ecology-caused pathology emerging among the children with hearing impairments one gave an opportunity to get positive changes among the indicators of their physical development. Due to the received data in the experimental group the calculated values of Quetelet index changed compared to the data from the control group, the average values of Quetelet index among boys and girls decreased which maximally brought the received results nearer to norm indicator. The calculated values of Robinson index became more demonstrative in the assessment of cardiovascular system. Due to the received data the dependable decrease of average values of the presented index took place becoming an attribute of optimization of cardiovascular system activity among the boys and girls of specifically the



experimental group. The dynamics of data change of the presented indicator of the control group of boys and girls with hearing impairments during the experimental year remained unchanged [5, 9].

The changes of calculated values of birth-death ratio got higher value and became more informative. We established that average values of birth-death ratio among the students of the control group remained unchanged in the course of formative experiment, while the experimental group's data considerably improved. It was also revealed that dependable results increase of the force index indicator was observed only among the boys and girls of the experimental group [5, 9].

The comparative analysis of the results of physical performance manifestation according to the Harvard step-test demonstrated positive changes in the level of physical performance manifestation as well as general endurance within the experimental group. The increase of the number of average level students, higher than average, and, mainly, high level of physical performance manifestation occurred [5, 9].

Yet in the experimental group the dynamics of positive changes was more evident: thus the number of the schoolboys and schoolgirls with the grade «bad» dependably decreased by 11.81 % and 17.49 %, respectively, and with the grade «satisfactory» - by 8.00% and 9.59 %. The fact being the most considerable appeared to be that the number of the schoolboys and schoolgirls with the grade «excellent» increased by the study findings by 25.00 % and 14.06 % [5, 9].

Yet the most considerable

achievement of the author's technology's implementation, as we see it, are the results of decrease of heavy metals concentration in the urine of the schoolchildren of the experimental group compared to the data of the control group before and after the experiment, namely: the decrease of lead level in the urine of the children of the experimental group resulted in 20-25 % on average due to including the exercises with variable workloads and gaming direction provided that being dressed in warmer clothes; decrease of zinc concentration level in the urine of the schoolchildren of the experimental group occurred due to including the exercises of cyclic direction on open air during field classes and resulted in 48 % among boys, and 41 % among girls; including only one class in the swimming pool with basic swimming elements and games in the water gave an opportunity to decrease the chromium composition in the urine of the experimental group contingent by 31 % among boys and by 27 % among girls, respectively [5, 9].

Therefore, the reviewing of the pedagogical experiment results on the final stage of the study using formation of structural and system criterion showed that the experimental groups of school children with hearing impairments were far ahead of the control groups of children with hearing impairments. We achieved the positive pedagogical effect of implementing our developed concept.

Conclusions.

The received data allows us to make a conclusion that resulting of research and experimental work the efficient system of promoting health-development of personality of the children with hearing impairments under



conditions of inclusive education being realized during studying at the specialized educational institution was created.

This statement was formulated based on the revealed positive changes of the experimental groups' indicators compared to the control groups' values. As it was revealed, the experimental groups' schoolchildren with hearing impairments improved their levels of theoretical and practical skills which indirectly influenced the increase of their physical activity and levels of physical

preparedness and caused the emergence of positive dynamics among morphofunctional and psychophysiological indicators, as well as decreased the level of sickness rate and improved their health state.

The prospects for further research are systematization of methods and technologies of health-development; development and testing of tools for optimization of health-developing environment under conditions of specialized educational institutions and general educational institutions.

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