

Effectiveness of physical therapy for autonomic dysfunction in adolescents

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Purpose: based on the generalization of the results of modern domestic and foreign scientific and methodological literature to develop a physical therapy program for adolescents with autonomic dysfunction.

Material & Methods: under our supervision there were 30 children 15–17 years old with a diagnosis of vegetative-vascular dystonia. According to the purpose and objectives of the study, anthropometric methods were used, the condition of the musculoskeletal system was studied using the stoop index and REEDCO posture assessment, the static balancing was determined using the Bondarevsky test, the Kerdo index was calculated, and mathematical statistics methods were used.

Results: a physical therapy program was developed, which included kinesiotherapy, elements of psychotherapy and auto-training, post-isometric relaxation. After applying the physical therapy program in adolescents, complaints of headache and dizziness decreased. The dynamics of the assessment of posture and stoop index indicated a significant improvement in all the studied parameters from the cardiovascular system; a decrease in the rate of cardiovascular contractions, an increase in the numbers of systolic blood pressure and the Kerdo index were observed.

Conclusions: the physical therapy program was developed taking into account the principles of physical therapy, the effectiveness of the program is confirmed by improving empirical parameters, indicators of the musculoskeletal system, cardiovascular system and quality of life, reduced as a result of autonomic dysfunction.

Keywords: physical therapy, adolescents, autonomic dysfunction.

Introduction

According to WHO, about 80% of the world's population suffer from autonomic dysfunction. Most doctors believe that this diagnosis is a complex of nervous disorders, and some scientists define autonomic dysfunction as a separate diagnosis. As shown by numerous epidemiological studies, vegetative disturbances in the population, starting from puberty, occur in 25–80% of cases [3; 6].

Vascular dystonia occurs due to nervous tension or after acute and chronic infectious diseases, poisoning, vitamin deficiency, nervous breakdowns. Symptoms of vascular dystonia can be persistent or manifest as seizures - the so-called vegetative-vascular paroxysms [2].

Adolescence is an important period of human growth and formation, when a number of morphological and psychological processes arise, develops and ends, and many vital systems of the body become established. In adolescence, there is enhanced muscle growth, their strength increases dramatically; the mass of the brain and spinal cord reaches the level that is determined in an adult, the maturation of the cardiovascular system is almost complete, blood circulation functions reach an optimal level and puberty is stabilized. This age falls on the training period, which is associated with significant loads, including psychoemotional stress. During this period, adolescents increase sensitivity to environmental factors that affect the state of the body. But, on the other hand, the young body responds positively to preventive and therapeutic measures, which makes this activity quite effective [9].

Physical exercises stimulate the creation of a new positive dominant, which, according to the laws of negative induction, suppresses and helps eliminate the pathological stagnant focus in the cerebral cortex. Movements normalize the dynamics of the main nervous processes, their strength, mobility and balance, the regulatory function of the central nervous system and cause positive emotions, which is especially important in the treatment and prevention of autonomic dysfunction [1; 2].

However, in modern scientific and methodological literature there are few studies, and determined the purpose and objectives of our study.

Purpose of the study: based on a synthesis of the results of modern domestic and foreign scientific and methodological literature, develop a physical therapy program for adolescents with autonomic dysfunction.

Material and Methods of the research

The study was conducted on the basis of MI «City Children's Neurological Hospital No. 5». The study was conducted from September to December 2019, under our supervision, there were 30 children 15–17 years old with a diagnosis of vegetative-vascular dystonia.

According to the purpose and objectives of the study, a questionnaire was created, which was built taking into account the object and subject of the study. The questionnaire consisted of 10 questions requiring a positive (yes) or negative answer (no). To assess physical development, anthropometric methods were used according to standardized methods. Height, weight were measured, body mass index (BMI) was determined. The condition of the musculoskeletal system was studied using the Stoop Index and Posture Score (REEDCO Posture Score Sheet). To determine the statistical balancing (SB) – an indicator of the state of the musculoskeletal system, coordination of movements and the stability of the psychological attitude to achieve the best result, a Bondarevsky test was performed. Static balancing is one of the key tests that provides a description of the functional state of many body systems, as well as the interactions between them. The Kerdo Vegetative Index is one of the simplest indicators of the functional state of the autonomic nervous system, in particular, the ratio of the excitability of its sympathetic and parasympathetic departments is estimated.

Results of the research

Using the questionnaire, the following results were

obtained: 78% of respondents noted that they often experience headache, dizziness. When asked about sleep time, only 25.4% of young people observe sleep patterns (7-8 hours), all the rest go to bed "according to their mood". All respondents monitor personal hygiene, but only 11.7% of men use additional hardening agents. In our study, bad habits were not observed among adolescents. 100% of respondents said they do not smoke, do not drink alcohol. As the results of the survey showed, mainly the majority of respondents had insufficient motor activity. Only 19% of respondents attend sports sections several times a month, only one in three noted the presence of regular classes in their daily lives. When collecting anamnesis, adolescents had complaints of headache, dizziness, and weather dependence.

The construction of a kinesiotherapy program was based on a synthesis of scientific, methodological, and specialized literature, as well as data from empirical, clinical, and instrumental examination of subjects. At the beginning of the course of rehabilitation treatment, we had a conversation with the researchers about the need for their knowledgeable and active participation in the rehabilitation process. During the conversation, they explained about the consequences and social significance of the disease, as well as about rehabilitation means to eliminate them, about the quality of life, etc.

To solve this problem, we developed a physical therapy program for adolescents, which included kinesiotherapy, elements of psychotherapy and auto-training, post-isometric relaxation (Table 1).

Table 1
Physical therapy program

Program components	Main group
Stage: outpatient	
Kinesiotherapy	according to the individual program
Muscle relaxation	postisometric relaxation
Psychocorrection	diaphragmatic breathing, self-training
Conversations	during the entire course of therapy

The main means of kinesiotherapy was exercise. As special physical exercises, exercises were used to tone the muscles of the abdominal muscles, dynamic exercises for all muscle groups of the lower extremities, neck and trunk, special breathing exercises, exercises to strengthen the muscles of the trunk.

In the morning, tested persons performed morning muscle relaxation, which consisted of special exercises for tension and relaxation of all muscle groups in the body. Due to the fact that the subjects had low Bondarevsky test values, exercises were prescribed to increase the stability of the vestibular apparatus. The second group of special exercises, which contribute to improving blood supply to the roots of the spinal cord throughout its length, used coordination exercises.

During the work with patients during the classes, discussions were held on the topic "causes of the disease, consequences of the disease, means of prevention" and psychocorrection with the help of diaphragmatic breathing, auto-training according to Johann Schulz's technique.

During the examination, it was important to evaluate posture. In young men, the overall assessment on the REEDCO Posture Score Sheet acquired a value of 65.3 ± 2.34 points during the initial examination. After the treatment program, the indicator acquired a value of 78.2 ± 2.27 points, which indicates an improvement in the indices of the spine in the studied population (Figure 1).

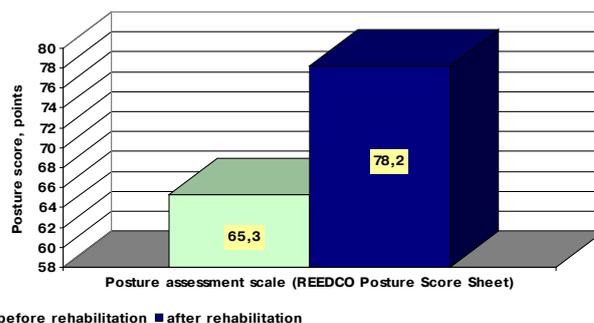


Fig. 1. Dynamics of indicators for assessing posture on the REEDCO scale for adolescents with autonomic dysfunction (n=30)

In the initial study, almost all tested persons had a tendency to stoop (86.28 ± 1.41 points). After applying the physical therapy program, the stoop index indicators approached standard values (Figure 2).

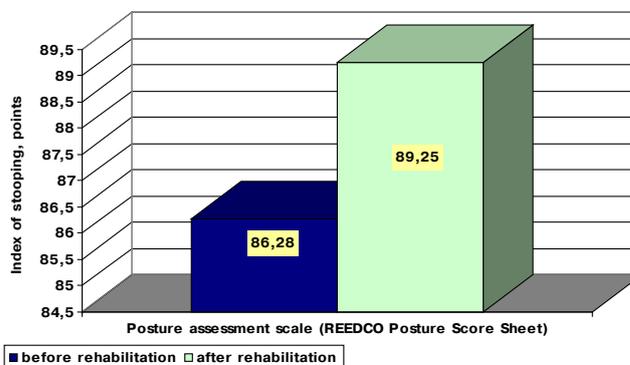


Fig. 2. Dynamics of evaluation of the stoop index of adolescents with autonomic dysfunction (n=30)

Since autonomic disturbances lead to a disorder in coordination, it was important to determine the level of static balancing in the contingent of subjects. At the beginning of the study, the BM index was 15.8 ± 1.8 s. After a second study, there was an improvement in the dynamics of the BM index to 20.4 ± 1.6 s.

When analyzing the dynamics of the indicators of the cardiovascular system, a decrease in heart rate from 14.30 ± 0.26 in 10 s to 11.33 ± 0.19 in 10 s was observed; the SBP indicator increased from 103.66 ± 2.70 mmHg. to 112.25 ± 4.19 mmHg.; the DBP indicator decreased from 74.44 ± 1.18 mmHg. to 68.17 ± 1.17 mmHg.

In the initial calculation of the Kerdo vegetative index, sympathicotonia was observed in 76.7% (23 people) of the subjects, and sympathicotonia became significant in 23.3% (7 people). After the proposed program of physical therapy, due to the decrease and stabilization of heart rate and blood pressure in the adolescents studied by us, the Kerdo index gained significance within the standard values. All of the above confirmed the effectiveness of the developed physical rehabilitation program for adolescents with autonomic dysfunction.

Conclusions / Discussion

The results of the analysis and generalization of the data of the special modern literature have confirmed the great importance of physical therapy in solving problems of comprehensively improving the physical health of children 15-17 years old with autonomic dysfunction [7]. The physical therapy program was developed taking into account the principles of physical therapy, the features of the morpho-functional state,

the functional capabilities of the state of the cardiovascular system, which included kinesiotherapy, elements of psychotherapy and auto-training, muscle relaxation.

The effectiveness of the developed program was confirmed by the improvement of empirical parameters, indicators of the state of the musculoskeletal system, cardiovascu-

lar system and quality of life, reduced as a result of autonomic dysfunction.

Prospects for further research are to study the long-term results of using the physical therapy program for adolescents with autonomic dysfunction.

Conflict of interests. The authors declare that no conflict of interest.

Financing sources. This article didn't get the financial support from the state, public or commercial organization.

References

1. Yepifanov, V.A. (2006), *Lechebnaya fizicheskaya kultura* [Therapeutic physical education], Moscow. (in Russ.)
2. Ivanova, L.I. (2009), *Metodyka fizychnoho vykhovannia u spetsialnykh medychnykh hrupakh* [Methods of physical education in special medical groups], Kyiv. (in Ukr.)
3. Lezhenko, H.O. & Pashkova, O.Ye. (2011), "Vegetative dysfunctions in children. Pathogenesis, diagnosis and therapeutic tactics", *Dytiachyi likar*, No. 4 (11), pp. 20-32. (in Ukr.)
4. Popov, S.N., Valeev, N.M., Garaseeva, T.S. et al. (2008), *Lechebnaya fizicheskaya kultura* [Therapeutic Physical Culture], S.N. Popov (red.), Moscow. (in Russ.)
5. Margazin, V.A., Koromyslov, A.V., Lobov, A.N. et al. (2015), *Lechebnaya fizicheskaya kultura pri zabolevaniyakh serdechno-sosudistoy i dykhatel'noy sistem* [Therapeutic physical education for diseases of the cardiovascular and respiratory systems], V.A. Margazin i A.V. Koromyslov (red.), S.-Pb. (in Russ.)
6. Litvinenko, N.V. (2012), "A Modern Look at the Problem of Autonomic Dysfunction", *Zdorovia Ukrainy*, No. 6, pp. 49. (in Russ.)
7. Ruban, L.A. (2014), "Diagnostic Aspects and Prevention of Vegetative-Vascular Dystonia in Students. Actual Problems of Biomedical Support of Physical Culture and Sports", *Zbirnyk statei naukovykh i internet-konferentsii, 24 kvitnia 2014 r.*, KhSAPC, Kharkiv, pp. 98-105. (in Ukr.)
8. Ruban, L.A., Ivanov I.V. & Senchenko K.Ye. (2016), *Suchasni metody doslidzhennia u sporti. Chastyna II (na prykladi vykorystannia KardioLab ta Spirokom)* [Current Research Methods in Sport. Part II (using CardioLab and Spirok)], Kharkiv. (in Ukr.)
9. Ruban, L.A. & Ruban, V.O. (2017), "Functional state of the cardiovascular system as a diagnostic marker of autonomic dysfunction in schoolchildren", *Visnyk Prykarpatskoho universytetu. Seriya: Fizychna kultura*, Vyp. 25-26, pp. 263-268. (in Ukr.)
10. Laparidis, K., Lapousis, G., Mougios, V., Tokmakidis, S. & Petsiou, E. (2010), "A school-based intervention program for improving the risk factors for cardiovascular disease at ages 12 to 16", *Journal of Physical Education and Sport*, Vol. 27, No. 2, pp. 101-109.

Received: 10.01.2020.

Published: 29.02.2020.

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