

and conditions for their accomplishment. Practical component involves technology for designing recreational and health promoting activity.

Key words: concept, recreational and health-related activities, conceptual approaches, conceptual provision, technology of designing, population groups.

УДК 796.01

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Particularities of Vegetative Regulation and Adaptation Capabilities of Preliminary School Children with Hearing Function Disorder

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Topicality. Hearing disorder is one of mostly wide spread defects of hear perception, which offers negative impact on child speech formation, as well as his psychological and physical development, and lead to disability [1].

According to World Health Organization (WHO) information, more than 5 % world people (360 millions people) suffer in disabling hear missing, moreover, 32 millions of them are children, and, according to WHO prognosis, quantity of such patients will increase by 2020 on 30 %. [2]. High indexes of hearing disorder spreading for children are typical for many European countries: deaf children are presented with frequency 1:500 in England, during screening investigation of pupils in Sweden, it was estimated that 2,9 % of children has severe hearing decline [1]. It is evaluated that in Ukraine, 300 thousands of children has hearing disorder, who needs hear prosthesis, 11 thousands of them are completely deaf [3].

Rehabilitation of children with hearing limitations posturizes difficult, multidimensional task, due to the fact that such children have own distinguishing particularities of physical, as well as functional and psychological development [4; 10]. Hearing disorder in childhood are not infrequently combined with chronic system and organ disease, behavioural and adaptation disorders, decrease of motion activity, posture and coordination deviation [5; 6; 9; 13; 14].

One of the crucial periods of children development is preliminary school age. According to Ivakhnenko A., development of psychomotor function is going slowly in deaf children of preliminary school age, than in children with normal hearing of the same age [6]. It was proved by Santashova O. investigations the correlation between motor and cognitive area development for preliminary school pupils [5]. Detected changes are vital for development of speech, cognitive and social skills, what determines paramount importance of timely and objectively grounded rehabilitation.

Adaptive reaction formation for inadequate environment conditions and stress-causing factors remains the key basic direction in development of rehabilitation technology for children with hearing [1; 8]. It is known, that main part in formation of adaptation processes and internal homeostasis impact, as well as in pathogenesis of any condition belongs to vegetative nervous system (VNS). Subsequently, vegetative status evaluation becomes important criteria for rehabilitation tactic planning, which presents function direction of VNS, as integral regulating system of child's organism. However, Vegetative status problem in preliminary school children with hearing disorders, its conjugation with heart-vascular system adaptation potential, as key chain in building of rehabilitation programme, is described in literature inadequately.

Aim. To explore vegetative status of preliminary school children with hearing disorders and connected with it heart-vascular system adaptation capabilities.

Materials and Methods. We analyzed 42 pupils results aged between 7 and 10 ($8,3 \pm 0,2$) years old, among them 22 girls and 20 boys with hearing disorder.

Vegetative tonus was estimated by integral hemodynamic index or vegetative index of Kerdo (VIK) [11; 12]. Income data for its calculation were elementary hemodynamic parameters such as heart rate (HR) and arterial pressure (AP) [12].

Functional status of VNS was assessed by variation pulsometry (VP) indexes, which was provided by automatic diagnostic system «Cardio+» (SPE «Metecol», Ukraine), which use is respected to international recognised standards of AAMI (Association for the Advancement of Medical Instrumentation).

Main indexes of VP were analysed by R.Bayevski method: Mo (mode, sec), ΔX (delta x, sec), AMo (mode amplitude, %), TI (tension index) [9]. As normal range healthy children VP indexes was accepted, which was proposed by R. Soboleva [9].

Functional capabilities of heart-vascular system were assessed by coefficient of endurance (CE), adaptation potential(AP).

Examinations were provided before afternoon, in child's waking status, 1 hour after feeding and after from 10 to 15 minutes rest in comfortable for children condition.

Statistical treatment of investigation results was performed by methods of variation statistics with use of standard software SPSS 13,0 for Windows. For statistical data analysis we used descriptive statistics. Correlation analysis was provided by Pearson and Spearman.

Results. Results of performed investigation has shown sympathicotony domination for boys, what was confirmed by VIK ($28,9 \pm 1,7$) conventional units, eutony ($17,4 \pm 1,3$) conventional units was observed in 2,3 times rarely ($\chi^2=4,9$; $p=0,03$), (fig. 1).

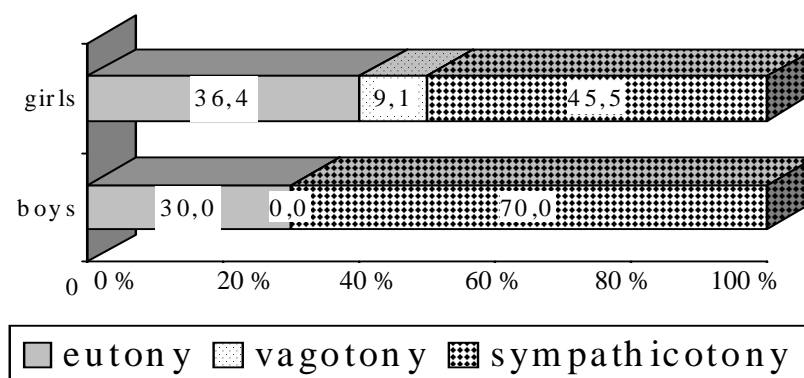


Fig. 1. Frequency of Distribution of Examinant Children by the Type of Vegetative Status.

It is interesting to mention, that in case of eutony it was fixed deficient autonomous regulation control, as same as central one, what is confirmed by decrease of VPR till ($3,9 \pm 0,2$) conventional units comparing with normal ranges ($8,2 \pm 1,3$) conventional units ($p < 0,01$) and TI ($50,7 \pm 2,7$) conventional units, which normally is $60,0 \pm 2,76$ conventional units ($p < 0,05$).

Estimated sympathetic hyperactivity was caused by enforcing of sympathetic part of VNS functioning ($r=0,52$; $p=0,004$) and insufficiency of parasympathic activity ($r=0,71$; $p=0,001$). Increase of AMo till $34,5 \pm 0,7$ %, which normal range is $27,0 \pm 0,84$ % and decline of variation dimension (ΔX) till $0,29 \pm 0,01$ sec, which normal range is $0,35 \pm 0,009$ sec, leads to the fact of sympathetic activity increase.

Vegetative imbalance was observed in case of central regulation mechanism tension ($r=0,68$; $p=0,02$), what is confirmed by risen in 1,6 times results of TI up to $94,0 \pm 3,9$ conventional units ($p < 0,001$). Autonomous contour activity compared with eutony increased, however leaves insufficient for circulation management supply in adequate volume, what is evidenced by decreased in 1,5 times indexes of VPR till $5,4 \pm 0,2$ conventional units comparing with normal range of $8,2 \pm 1,3$ conventional units ($p < 0,05$).

Sympathicotonic and eutonic type of VT was observed among girls with mostly the same frequency ($\chi^2=1,50$; $p=0,22$), in case VIK indexes equal to $29,2 \pm 1,0$ and $16,1 \pm 1,1$ conventional units, respectively. Parasympathicotony was found in few case, while VIK ($-7,0 \pm 2,3$) conventional units.

In difference to boys, vegetative balance in girls was determined in the same time by sympathetic and parasympathic part of VNS activation ($r=0,47$; $p=0,01$ and $r=0,42$; $p=0,03$), with AMo increase on 19,2 %, till $39,3 \pm 1,7$ %, ($p < 0,001$) and ΔX growth on 23,5 % till $0,31 \pm 0,01$ sec., ($p < 0,001$) with tension of humoral regulation channel ($r=0,44$; $p=0,04$), what is justified by Mo increase up to $0,75 \pm 0,01$ sec, ($p < 0,05$).

Domination of decreased humoral channel activity results (Mo) on 8,3 %, till $0,66 \pm 0,01$ sec, ($p < 0,001$) in 66,7 % of girls with sympathetic hyperactivity evidenced about disorder of vegetative balance due to some tension of nervous channel in VNS itself.

This tension in majority of children with hypersympathicotony also confirms rise of AMo on 26,0 % ($p < 0,001$), accompanied by high degree of regulation centralisation, increase of TI on 24,9 % ($p < 0,001$) in case of insufficient activity of autonomic regulation contour, i.e. decrease of VPR в 1,7 times ($p < 0,05$).

Performed researches let determine adaptation potential level of heart-vascular system, which features are shown in fig. 2.

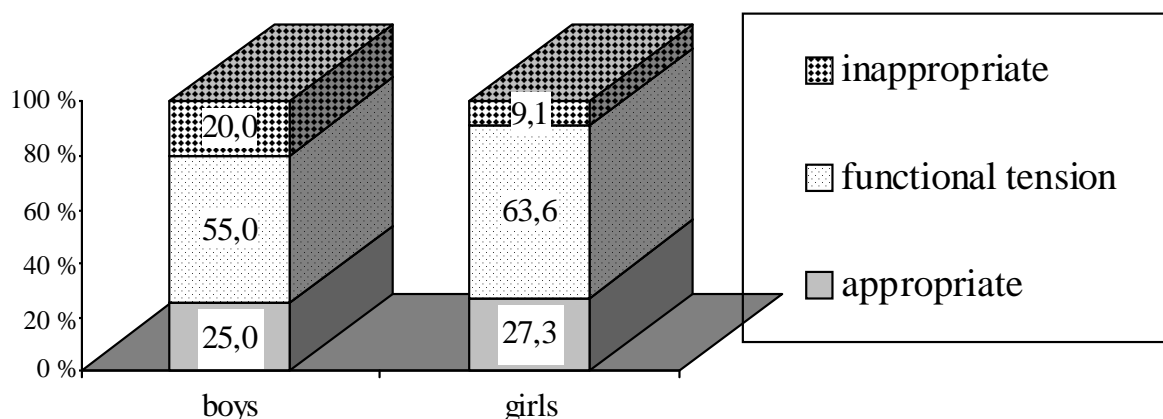


Fig. 2. Frequency of Investigated Children Distribution by Adaptation Potential

As presented data shows, appropriate adaptation was observed in a quarter of patients. Quantity of boys with inappropriate heart-vascular adaptation capabilities $3,8 \pm 1,15$ has increase trend in compare with girls ($3,5 \pm 1,4$), ($\chi^2=0,03$; $p=0,85$).

Maximal specific gravity in structure of adaptation potential changes was presented by functional tension, which same frequently observed as among boys ($2,71 \pm 0,06$) as among girls ($2,28 \pm 0,05$).

Analyzing functional heart-vascular system status by coefficient of endurance, it is estimated, that this index was increased up to $22,6 \pm 0,8$ conventional units for all boys, what evidenced to detraining of heart-vascular system.

Among girls the same changes were found in 77,3 % of cases with growth of KB till $22,2 \pm 0,5$ conventional units.

Overall, comprehensive analysis of physiological parameters, describing homeostatic capability of VNS, allowed to estimate, that vegetative regulation process in preliminary school age children with hearing disorder is going on in imbalance mode in VNS. Its nature was defined by particularities of vegetative heart activity regulation, and it has gender differences and отражается on adaptive capabilities of children body, what is important to take into attention while motion activity is planning during physical rehabilitation.

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Abstract

Indexes of vegetative nervous system functional status were explored in preliminary school children with hearing disorder. Functional status of VNS was assessed by variation pulsometry. Functional capabilities of heart-vascular system were assessed by coefficient of endurance, adaptation potential. Comprehensive analysis of physiological parameters characterizing VNS homeostatic capabilities allowed to estimate, that vegetative regulation process in preliminary school age children with hearing disorder is going on in imbalance mode in VNS. Performed researches let determine adaptation potential level of heart-vascular system. Detected gender particularities of vegetative heart activity regulation and its adaptation potential become ground of development of optimal motion activity regimen in physical rehabilitation process.

Key words: *Vegetative status, adaptation, hearing disorder, preliminary school children.*

Сергій Афанасьєв. Особливості вегетативної регуляції та адаптаційних можливостей дітей молодшого шкільного віку з порушенням слухової функції. *Вивчено показники функціонального стану вегетативної нервової системи в дітей молодшого шкільного віку з порушеннями слуху. Функціональний стан ВНС оцінювали за показниками варіаційної пульсометрії. Функціональні можливості серцево-судинної системи оцінювали за коефіцієнтом витривалості, адаптаційного потенціалу. Комплексний аналіз фізіологічних параметрів, що характеризують гомеостатичні можливості ВНС дав змогу встановити, що процес вегетативної регуляції в дітей молодшого шкільного віку з порушеннями слуху здійснюється в режимі дисбалансу вегетативної нервової системи. Проведені дослідження сприяли визначенню рівня адаптаційного потенціалу серцево-судинної системи. Виявлено гендерні особливості вегетативної регуляції серцевої діяльності та її адаптаційний потенціал, які стануть підставою для розробки оптимальних режимів рухової активності в процесі фізичної реабілітації.*

Ключові слова: *вегетативний статус, адаптація, порушення слуху, молодший шкільний вік.*

Сергей Афанасьев. Особенности вегетативной регуляции и адаптационные возможности детей младшего школьного возраста с нарушениями слуховой функции. *Изучены показатели функционального состояния вегетативной нервной системы у детей младшего школьного возраста с нарушениями слуха. Функциональное состояние ВНС оценивали по показателям вариационной пульсометрии. Функциональные возможности сердечно-сосудистой системы оценивали по коэффициенту выносливости, адаптационному потенциалу. Комплексный анализ физиологических параметров, характеризующих гомеостатические возможности ВНС, позволил установить, что процесс вегетативной регуляции у детей младшего школьного возраста с нарушениями слуха осуществляется в режиме дисбаланса вегетативной нервной системы. Проведенные исследования позволили определить уровень адаптационного потенциала сердечно-сосудистой системы. Выявленные гендерные особенности вегетативной регуляции сердечной деятельности и ее адаптационный потенциал станут основой для разработки оптимальных режимов двигательной активности в процессе физической реабилитации.*

Ключевые слова: *вегетативный статус, адаптация, нарушения слуха, младший школьный возраст.*