

**DYNAMIC OF VERTICAL STABILITY INDICATORS OF JUNIOR SCHOOLCHILDREN, WHO HAVE WEAKENED HEARING, UNDER INFLUENCE OF PHYSICAL EDUCATION MEANS**Storozhik A.I., Guligas A.G., Tumanova V.N.  
Borys Grinchenko Kyiv University**Abstract**

**Purpose:** study of physical education means' influence on vertical stability indicators of junior school age children with weakened hearing. **Material:** in experiment 26 pupils of 7-8 yrs. age with different hearing problems participated. **Results:** it was found that effectiveness criteria of physical education means' influence on child's balance function are: reduction of amplitude of general body mass center's oscillations (eyes opened) in main stance on immobile support; reduction of general body mass center's oscillations in Romberg's test; increasing of posture's keeping time in Bondarevskii's test. **Conclusions:** it was determined that application of technology of body vertical balance formation in junior schoolchildren with weakened hearing conditions positive dynamic of main indicators of body vertical balance.

**Key words:** dynamic, balance, indicators, stability, effectiveness, shifts.

**Introduction**

Children with health problems need care and attention of pedagogues and physical education specialists much more than any other population strata [8, 14, 15]. Indeed, practicing of physical exercises facilitate not only strengthening of their motor skills, which, due to a number of reasons, are weaker than in practically healthy children, but also help social adaptation, overcoming of self-uncertainty, develop ability to work in team. That is why problems, connected with compensation of infracted or lost children's functions, attract great interest of specialists.

Scientific works in field of physical education of children with weakened hearing witness that it is possible to influence on psycho-physiological qualities of children with weakened hearing, by developing their motor skills [9].

Besides, scientists make efforts in studying of psycho-motor functions of children of the mentioned nosology. For example, at present L.S. Gartseva offered and tested correction methodic for psycho-motor function of 8-10 yrs. Age children with weakened hearing. Its basis is exercises, oriented on development of space and space-time orientation, speed, balance, coordination. With it among methodic techniques means, based on strengthening of requirements to visual, vestibular and tactile analyzers, prevailed [4, pg. 9]. At the same time A.A. Ivakhnenko suggests to solve problem of development of such children's psycho-motor functions in process of specially organized game functioning. It conditions demand in working out of games, considering specificities of physical and psychic condition of children with weakened hearing [6, c. 68].

Methodic of physical education of children with weakened hearing, based on fit-ball gymnastic, "little" acrobatic and articulation gymnastic, worked out by V.V. Verbina [3, pg. 45] is also interesting. Positive shifts in physical fitness indicators are achieved at the account of interchangeability of exercises, which are components of systems "Exercise", "Game", "Word" [3, pg. 47].

I.V. Khmel'nitskaya offered to apply computer monitoring of motor functioning in programming of physical culture lessons [11, 12]. The author proves that there are interconnections between coordination abilities and psycho-motor characteristics in junior schoolchildren with hearing deprivation.

As per already conducted researches children with weakened hearing have weak ability to keep balance [13]. In this case calisthenics means are recommended [7, pg. 47].

Among specialists' recommendations the most interesting are methodic of development of vertical stability of disabled children. Effectiveness of methodic of vertical stability development of children with intellectual deficit was proved; it was based on principle of increasing of coordination difficulty of exercises, applied for development of static and dynamic balance [5, pg. 228].

Nevertheless, among scientific works [9, 16, 18] there were no papers, in which effectiveness of process of development of children's with weakened hearing functions would have been proved with the help of quantitative, space and time analysis of body stability.

**Purpose, tasks of the work, material and methods**

*The purpose of the work* is assessment of dynamic of vertical stability indicators of junior schoolchildren with weakened hearing under influence of selected beforehand means of physical education and specially created pedagogic conditions for their usage in the process of adaptive physical education (APE).

In the course of our research we conducted forming experiment in control (CG) and experimental (EG) groups (13 tested in every group). Dynamic of abilities to keep static balance was assessed with the help of Ye.Ya. Bondarevskii's test [2]. Besides, in order to determine amplitude-frequency characteristics of GMC we used method of stabilography [1]. For this purpose we used platform Kistler. The researches were conducted on the base of laboratory of bio-mechanical technologies in physical education and Olympic sports of SRI of National University of Physical Education and Sport of Ukraine.

We used two tests: main stance on stationary support with closed and open eyes and Romberg's test on stationary support with closed and open eyes [17]. Methods of mathematical statistic permitted to process empiric data and to find out certain regularities and make reasonable conclusions.

### Results of the researches

By results of our researches we worked out technology of correction of vertical body stability of 7-10 yrs. age children with weakened hearing [10].

Assessment of the offered technology's effectiveness was carried out with the help of determined criteria: reduction of child's body GMC oscillations in main stance on stationary support with open eyes; amplitude of body GMC oscillations in Romberg's test; Increase of times of posture's keeping in Bondarevskii's test.

In process of physical education in EG we used the offered technology of correction of vertical body stability's disorders [10]. CG was trained by traditional program.

Analysis of rate of increment of vertical body stability indicators in CG permitted to detect:

- Time of posture keeping in Bondarevskii's test increased by 2.55%;
- Amplitude of body GMC oscillations in main stance reduced by 0.97%;
- Amplitude of body GMC oscillations in Romberg's test reduced by 0.58% (see table 1).

Table 1

*Amplitude of body GMC of children with hearing deprivations before and after experiment, (n=26)*

Description of test	Control group, (n=13)				Experimental group, (n=13)			
	Before		After		Before		After	
	$\bar{x}$	$S$	$\bar{x}$	$S$	$\bar{x}$	$S$	$\bar{x}$	$S$
Main stance, mm	10.6	0.6	10.5	0.6	10.4	0.6	10.0*	0.4
Romberg's test, mm	13.7	0.5	13.6	0.5	13.6	0.5	13.2*	0.5
Bondarevskii's test, sec.	14.3	4.2	14.5	3.6	15.0	4.2	17.5*	3.2

Notes: confidence of differences by t-criterion of Stjudent; \* $p < 0.05$  ( $p^{**} < 0.01$ ) comparing of indicators before and after experiment

The determined shifts of indicators of vertical stability in CG turned out to be statistically not confident ( $p > 0.05$ ).

The observed dynamic of vertical stability indicators in EG was as follows:

- Time of posture keeping in Bondarevskii's test increased by 15.56%;
- Amplitude of body GMC oscillations in main stance reduced by 3.57%;
- Amplitude of body GMC oscillations in Romberg's test reduced by 3.09%.

As we can see in EG changes of the tested indicators are more expressed, comparing with CG pupils. Especially it was noticeable in indicator, characterizing posture keeping time.

Comparative analysis of the received data permitted to determine that indicators of vertical stability in EG statistically confidently improved in all tested parameters ( $p < 0.05$ ). In CG we did not observe any substantial changes of the tested indicators.

The conducted research showed that before experiment initial and middle levels of static stability was characteristic for 38.5% (n=5) of CG children and 46.2% (n=6) of EG children. With it 30.8% (n=4) of CG and 38.5% (n=5) of EG members demonstrated high level of the mentioned parameter. As we can see differences between groups were insignificant. However, after experiment situation principally changed: if in CG among children with initial and middle levels of static balance we found 30.8% (n=4), than in EG – only 7.7% (n=1). Such changes in EG happened at account of increase of quantity of children with high static stability up to 69.2% (n=9) (see fig. 1).

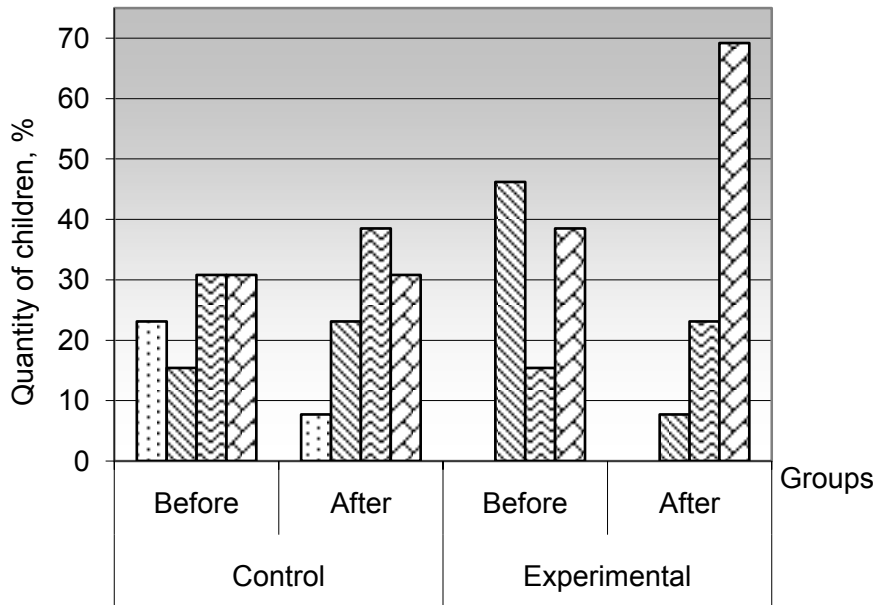


Fig. 1. Distribution of the tested by level of static balance before and after experiment (n=26), %  
 □ -high; ▨ - sufficient; ▩ -middle; ▧ - initial

The obtained results witness about positive influence of the offered by us technology of vertical stability formation of 7-10 yrs. age children with weakened hearing on vertical stability of disabled junior schoolchildren.

#### Discussion

In the course of our research we proved and supplemented data, which were rendered by other specialists. For example we proved information about deprivations of balance function in junior schoolchildren with weakened hearing [3, 4, 5].

At the same time we supplemented data of specialists about usage of stabilography method for determination of body vertical stability's indicators. With it we registered that reduction of GMC oscillations' amplitude witnesses about improvement of body vertical stability [2, 19, 20]. It should also be noted that junior schoolchildren with weakened hearing do not demonstrate statistically significant increase of GMC oscillations under influence of physical education means.

Usage of stabilography method ensures quantitative assessment of vertical body stability's indicators. Such approach to determination of effectiveness of pedagogic influences on children's balance function increase reliability and accuracy of measurements, comparing with assessment with the help of motor tests.

#### Conclusions

In spite of specialists' interest to perfection of motor skills of children with hearing deprivations, by present time problems of vertical body stability of junior schoolchildren with weakened hearing under influence of physical education means have not been solved completely.

Criteria of effectiveness of vertical body stability's correction for children with hearing deprivations are positive changes of indicators, which characterize the following:

- Reduction of GMC oscillations' amplitude in main stance on stationary support with open eyes;
- Reduction of GMC oscillations' amplitude in Romberg's test;
- Increase of time of posture's keeping in Bondarevskii's test.

It has been proved that in EG there happened statistically significant improvements of GMC oscillations' indicators (in main stance and in Romberg's test). The same was in Bondarevskii's test ( $p < 0.05$ ). With it in CG there have been registered no statistically significant changes of the tested indicators ( $p > 0.05$ ).

After experiment in EG quantity of children with high static balance level increased by 30.7%. It happened at the account of reduction of quantity of children with initially middle level of static balance. At the same in CG we did not observe such shift.

In general the worked out by us technology of vertical stability correction for 7-10 yrs. age children with weakened hearing is effective and it is purposeful to apply it in physical education of children of such nosology.

He further researches will be oriented on assessment of changes in junior school age children's postures (children with weakened hearing) under influence of the offered by us technology of vertical body stability's formation for 7-10 yrs. age children.

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#### Conflict of interests

Author declares absence of no conflict of interests.

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**Information about the authors:**

**Storozhyk A.I.:** <http://orcid.org/0000-0001-6340-7199>; Arlett\_85@bigmir.net; Borys Grinchenko Kyiv University; Marshal Timoshenko's str. 13-B, Kiev, 04205, Ukraine.

**Guligas A.G.:** <http://orcid.org/0000-0002-0617-0727>; Diving72@ukr.net; Borys Grinchenko Kyiv University; Marshal Timoshenko's str. 13-B, Kiev, 04205, Ukraine.

**Tumanova V.I.:** <http://orcid.org/0000-0002-9838-6081>; V.tumanova@kubg.edu.ua; Borys Grinchenko Kyiv University; Marshal Timoshenko's str. 13-B, Kiev, 04205, Ukraine.

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