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## MASTERING OF MUSICAL RHYTHM BY PRE-SCHOOL AGE CHILDREN WITH SPEECH DISORDERS WITH THE HELP OF DANCE-CORRECTION PROGRAM TRAININGS

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**Abstract.** *Introduction:* It is known that regular listening to specially selected music develops children's cognitive abilities. Musical influence optimizes many important functions of brain: increases mental workability; accelerates processing of information; improves short term memory. Besides, sensitivity of visual and hearing analyzers strengthens, as well as regulation of arbitrary movements; indicators of verbal and non verbal intellect improve. *Purpose:* to determine peculiarities of musical rhythm's mastering by pre-school age children with speech disorders with the help of dance-correction program trainings. *Material:* the categories of the tested children: children of age – 4-5 and 5-6 years with speech disorders and healthy pre-school age children. Children of 4-5 years' age composed: main group (n=12), control group (n=16); group of healthy children (n=24). For assessment of verbal thinking and rhythm-motor (or dance) abilities we used complex of tests of constantly increasing difficulty. *Results:* we found that under influence of dance-correcting exercises activation of rhythm-motor abilities and development of cognitive functions happened in children. We also found main functional peculiarities of musical rhythm's mastering by pre-school age children. It was determined that by the end of pedagogic experiment, main groups of children approached to groups of healthy peers by all tested characteristics. *Conclusions:* it is recommended to include correcting components (fit ball – dance gymnastic, tales-therapy, logo-rhythm trainings, and game fitness) in trainings by choreographic program.

**Key words:** pre-school children, speech disorders, cognitive, musical rhythm, motor abilities.

### Introduction

Great number of scientific works proves that different kinds of musical activity influence positively on children's mental functioning. Musical classes improve psychic processes of perception, attention, memorizing [7]. People's rhythmic musical activity has been known since ancient time. To this activity we can relate drumming and play other musical instruments, dances, and singing [13, 15, 19]. Musical sounds cause spontaneous body reactions – motion in tact, rhythmic tapping, clapping [16, 17, 22]. It is also known that newborns imitate faces and gestures of adults [18], synchronize movements of their bodies with adults' speech [14]. 3-4 months' babies demonstrate limbs' movements under rhythmic music [16]. In the age of one year babies can fulfill more rhythmic movements, show emotions, listening to music [24]. Rather often adults' drumming causes spontaneous reaction of senior pre-school age children: they also start drumming [17]. Thus, music's influence on child's brain with specially selected program is a structuralizing mean and optimizes brain's functioning in period of its formation. That is why it is important that since birth (and even before birth) child has had opportunity to listen to beautiful music.

As it is shown in scientific researches, regular listening by children to specially selected music improves short-term memory, increase indicators of verbal and non verbal intellect. With it, sensitivity of visual and hearing analyzers improves; brain functions optimize; regulation of arbitrary movements becomes better; processing of information accelerates. All these, in the whole, positively influence on mental workability [12]. It is known that located in frontal part of brain area is called in honor of French neurologist of 19<sup>th</sup> century Brock. It is of great importance for fulfillment of sequential physical movements, for recognition of musical rhythms, for transformation of thought in pronounced words. Scientists assume that the processes in Brock's area take part in perception of musical temp, speech and motion [21]. It is very important to consider this fact in period of organism's growth; it can influence on organization of teaching processes [20].

As far as perception of music is realized by both brain hemispheres, in cortex appears complex functional system of focuses of inter-connected activity in sensor (hearing) and frontal lobe areas of cortex [11].

Musical-rhythmic motor activity is a synthetic kind of functioning. It is a natural combination of two arts: music and dance, creating new quality – single and aesthetic wholeness. For children with speech disorders it is of

special importance. Motor exercises under musical accompaniment train motor memory, ensuring mobility of nervous processes [1, 2].

Organization of movements develops children's attention, memory, concentration; it facilitates formation of purposeful activity. It is connected with the fact that characteristic for them peculiarities of motor and psychic spheres are easily corrected. Form of trainings with the help of musical rhythm develops memory, attention, thinking, imagination; it awakens interest to creative activity [3, 4, 5, and 8].

In connection with absence of social-economic stability, in modern society exist difficulties, connected with formation of children's emotional-adaptation processes. As a result they have speech functions' disorders.

In practice, the presented below dance-correction program facilitates correction of children's speech functions by development of nervous structures, activation of analyzers; improvement of psycho-physiological properties and cognitive functions. In this context important task is to teach children to move under music, expressing its temp, dynamic and metric-rhythmic features.

The main means of this program are: fit ball – dance gymnastic, tales therapy, logo-rhythmic, game fitness and some other correction methodic. All these means are combined in complexes of definite sequence.

*The purpose of the work* is to determine specificities of pre school age children's with speech disorders mastering musical rhythm with the help of dance-correction program.

#### **Material and methods**

*Participants:* categories of the tested: children of 4-5 and 5-6 years' age with speech disorders and healthy peers. Children of 4-5 years age composed: main group (n=12), control group (n=16); group of healthy children (n=24).

The researches were conducted with observation of moral-ethic norms and voluntary consent of parents. The parents gave individual written consents for participation of children in pedagogic experiment (control of children's physical condition).

*The procedure:* assessment of cognitive functions and rhythm-motor (or dance) abilities of 4-5 and 5-6 years' age children with speech disorders was fulfilled at the beginning and at the end of academic year. We used a complex of tests of gradually increased complexity. The tests permitted to assess functional mobility of nervous processes, verbal thinking, visual and hearing memory, attention, workability, dance abilities and some other functions [6]. Accounting of points was in the following procedure: high level - 9-10 points; above average - 7-8, average – 5-6, below average– 3-4 and low — 1-2 points. I.e. it was analogous to assessment of cognitive functions, where accounting of points was in the same way [4].

Assessment of verbal thinking was carried out by methodic of Ya. Yerasyk [6, pg.137-140]. Its basis was formulated by a child answers to the questions put to him/her.

Determination of rhythm-motor (dance) abilities was carried out on the base of analysis of how child combines several movements and coordinates them with musical accompaniment. With the help of special assessment scale we determined: musicality, creative bents, coordination of dance movements, plasticity (flexibility).

*Statistical analysis* was fulfilled with the help of «StatSoft STATISTICA 10.0» programs. The tested sample was not suitable for normal distribution by the tested indicators. That is why we applied the methods of non parametrical statistic. For demonstration of the data we used median (Me) and interactive scale with noting lower (l.q.-25%) and upper quartiles (up.q.-75%). For testing of differences between two dependent samples of pair measurements we used T-criterion of Wilkoxson. The criterion serves for comparing of indicators, measured in two different conditions in one and the same sample. It permits to determine orientation of changes and their expressiveness. With this criterion it is possible to determine if shift of indicators in one direction is more intensive than in other. Differences were confident at  $p < 0.05$  [23].

#### **Results**

Basing on the received data we found multiple confident differences of cognitive functions and rhythm-motor (dance) abilities in 4-6 years' age children with speech disorders and healthy children (see table 1).

In main group of 4-5 years' age children with speech disorders we observed confident cognitive functions' improvement in average by 20.3% (by results of tests). Such noticeable result is connected with the fact that this group was not uniform [4]. At the same time, in this group rhythm-motor abilities confidently improved in average only by 11.5% (see table 2).

**Table 1.** Change of cognitive functions and dance abilities in 4-6 years' age children with speech disorders and in healthy children 1.

I	Main group, 4-5 years, n=12						Control group, 4-5 years, n=18						Healthy children, 4-5 years n=13					
	Before			After			Before			After			Before			After		
	Me	l.q.	Up.q.	Me	l.q.	Up.q.	Me	l.q.	Up.q.	Me	l.q.	Up.q.	Me	l.q.	Up.q.	Me	l.q.	Up.q.
CF	6.4*	5.2	6.6	7.7*	6.4	8.1	4.1*	2.0	5.2	4.2*	3.2	6.2	9.0	7.2	9.0	9.0	8.0	9.0
DA	6.5*	5.5	6.8	7.3*	6.7	8.0	5.2*	3.5	6.3	5.5*	3.8	6.5	8.5*	7.5	9.0	9.0*	8.5	9.0
	Main group, 5-6 years, n=14						Control group, 5-6 years, n=16						Healthy children, 5-6 years, n=24					
	Before			After			Before			After			Before			After		
	Me	l.q.	Up.q.	Me	l.q.	Up.q.	Me	l.q.	Up.q.	Me	l.q.	Up.q.	Me	l.q.	Up.q.	Me	l.q.	Up.q.
CF	6.2*	5.5	6.8	7.2*	6.8	8.0	6.9*	4.7	7.5	7.0*	6.2	7.6	8.4	7.0	9.0	9.0	7.8	9.0
DF	7.1*	6.0	8.0	7.7*	6.5	8.0	6.3*	5.6	7.1	6.7*	6.0	7.3	8.3	6.8	9.0	8.7	8.0	9.0

Notes: I – indicators; CF – cognitive functions; DA – dance abilities; l.q. – low quartile; (25%), up.q. – upper quartile (75%).

\* –  $p < 0.05$  confident differences between groups before and after application of dance-correction program.

Significant indicator of cognitive functions' percentage was registered only in main group children. Such picture was both in 4-5 and 5-6 years' age children. Confidently less percentage of cognitive functions was observed in 5-6 years' age children, in average by 16.1% (see table 2) and rhythm-motor abilities – by 8.5%. Indicator of 8.5% witnessed that these children approached to group of their healthy children.

**Table 2.** Results of confident cognitive functions' and dance abilities' changes in 4-6 years' age children at the end of academic year

Children's groups		Cognitive functions, %	Dance abilities, %
4-5 years	Main group	20.3	11.5
	Control group	2.4	6.8
	Group of healthy children	0	5.9
5-6 years	Main group	16.1	8.5
	Control group	1.4	6.4
	Group of healthy children	0	0

In the process of trainings with application of dance-correction program we found multiple functional changes. Under influence of dance-correction exercises children's rhythm-motor abilities activated and cognitive functions developed, being interconnected.

On the one hand dance-correction exercises implied involvement of short-term and long-term memory (cognitive elements) for memorizing and reproduction of dance figures. On the other hand these exercises actively influenced on cortex motor-neurons, developing motor centers. At the same time, constant changes of combinations and rhythms in a dance stimulated brain neurons to re-switch, thus, developing mobility of nervous processes.

This thesis is proved by the fact that main group children could conduct graduation concert by themselves. That is, they were presenters; they showed concert program's items, song, read poetry and danced that witness about positive influence of the worked out means on correction of speech disorders.

In control group of 4-5 years' age children with speech disorders the character of changes was a little different. Cognitive functions' percentage increased, in average, by 2.4%, and rhythm-motor abilities – by 6.8%. Nevertheless, in percents it was less than in main group. In 5-6 years' age children we found confident improvement of cognitive functions – by 1.4%, and rhythm-motor abilities – by 6.4%.

In control group of 4-5 and 5-6 years' age children we found confident improvement of cognitive functions and rhythm-motor abilities. They were less than in main groups.

The received result is connected with the fact that these children were trained by traditional (standard) choreographic program without correcting elements (fit ball – dance gymnastic, tales therapy, logo-rhythmic, game fitness). New correcting components were used only in main groups. Accordingly, this standard program was rather effective. But it was less effective than dance-correction program.

In group of healthy 4-5 years' age children we registered confident improvement of rhythm-motor abilities by 5.9% but no changes of cognitive functions.

In group of 5-6 years' age healthy children we registered no confident changes of cognitive functions and rhythm-dance abilities. It is explained by the fact that this category of children had no speech disorders and fulfilled standard choreographic program.

We determined that main groups of 4-5 and 5-6 years' age children with speech disorders significantly improved their indicators. Development of main group children's memory permitted for them to move more rhythmically and musically. In motion children song, counted spoke and stomped different tale-dance storylines. Thus, the worked out program showed progress of such cognitive functions as memory, attention, thinking, imagination, functional mobility of nervous processes in children. Besides, it helped to involve children in creative process and awakened their interest to activity. The main achievement is the fact that children became speak better, to actively contact with other people and feel musical rhythm.

### **Discussion**

The received results supplement the data of researches in the field of music influence on children's mental functioning and brain functions [7].

It has been shown that regular children's listening to specially selected music improves short-term memory and verbal and non-verbal intellect. As a result of musical influence sensitivity of hearing and visual analyzers improves; brain functions optimize; regulation of arbitrary movements improves; information's processing accelerates and mental workability increases [12].

The received data supplement awareness of different authors [8, 9, 14, 15, 16, 17, 21] about peculiarities of musical rhythm's, temp, speech and motion's mastering.

In period of organism's growth, under influence of dance-correction exercises activation of rhythm-motor abilities and development of cognitive functions take place in children. These functions are interconnected and can influence on organization of further teaching [20]. Dance-correcting exercises imply involvement of short term and long term memory (cognitive elements) for memorizing and reproduction of dance figures. These exercises actively influence on cortex motor-neurons, thus, developing motor centers. Constant changes of combinations and rhythms in dance stimulate brain neurons to re-switch, thus, developing functional mobility of nervous processes.

Results of the research also substantially supplement ideas about mastering of musical rhythm by pre-school age children with speech disorders [5, 15, 19, 20, and 24]. We proved results of a number of authors about demand in complex and rational application of correcting methods in pre-school education. Such approach results in increase of effectiveness of cognitive functions' and rhythm-motor abilities' development in children with speech disorders [7, 8].

### **Conclusions**

1. Peculiarities of musical rhythm's mastering by pre-school age children with speech disorders with the help of dance-correction program have been found.

2. In process of choreographic classes with pre-school children of 4-6 years' age with speech disorders we applied the worked out by us dance-correction program.

3. Changes of cognitive functions of 4-6 years' age children under influence of choreographic classes with application of dance-correction program were registered; their significance in correction of speech disorders has been shown. We found confident improvements of cognitive functions and rhythm-motor abilities in 4-5 and 5-6 years' age children with speech disorders. It has been shown that by all tested parameters main groups of 4-5 and 5-6 years' age children with speech disorders are very close to group of healthy peers. Positive dynamic of cognitive functions' and rhythm-motor abilities' progress in children with speech disorders witness about effectiveness of this methodic.

### **Conflict of interests**

The author declares that there is no conflict of interests.

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